ONTARIO

HORTICULTURAL CROPS

RESEARCH & SERVICES COMMITTEE

1999 ANNUAL REPORT
TO

ONTARIO AGRICULTURAL SERVICES

COORDINATING COMMITTEE

JANUARY 14, 2000

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EXECUTIVE SUMMARY

The Ontario Horticultural Crops Research and Services (OHCRSC) sub-committees reported on the many outstanding accomplished conducted this past year. Each sub-committee outlined the emerging issues and set priorities to address these concerns. The restructuring of OASCC allowed the OHCRSC to bring forth for the first time, officially at least, pest management issues and recommendations. Of the 39 recommendations, 23 or approximately 60% of the recommendations were pest related. Nine of these recommendations are being handled by the OHCRSC while 14, many of which where common issues, were referred, as directed by OASCC, to the OPMRSC.

It may be of interest to note the breakdown of the OHCRSC recommendations, see pages 147 to 176:

A. Referred to OPMRSC	3, 7, 8, 11, 12, 13, 14, 19, 20, 21, 29, 30, 36, 39	=	14
	- dealing with pesticide registrations, harmonization, minor use crop funding, the need for GLP compliance and import products having been sprayed with products not registered in Canada.		
B. Pest Related Issues	1, 4, 6, 10, 23, 28, 32, 37, 38	=	9
	- dealing with new pests, diagnostic procedures using PCR technology, plant-back labeling, FS 2002, IPM protocols.		
C. Erosion of Staff	2, 5, 15, 18, 27, 34	=	6
D. Information Availability	17, 25, 26, 35	=	4
	- dealing with proprietary information focusing specifically on public funded IRAP		
E. Referred to OSWARSC	19, 22, 24	=	2
	- dealing with water, compost and land issues		
F. Timeliness of responses	9	=	1
	- some managers do not respond to OASCC frustrating the process		
G. Weather networks	16	=	1
	- a need that has not yet been achieved		
H. Land Suitability	31	=	1
I. Tree Survey	33	=	1

It became obvious once again that continued efforts are needed to revisit OASCC procedures and protocols as 9 of the 16 sub-committee chairs changed this year. As stated in the OASCC manual, further changes will occur as the Chair of the OHCRSC has completed his 4 year commitment and now must leave room for the next chair. On a personal note, as the outgoing chair of OHCRSC, I wish to thank those who have "taken their turn" and contributed so much of their time and effort to the good of Ontario agriculture.

Ron Pitblado

INTRODUCTION

The Ontario Horticultural Crops Research & Services Committee (OHCRSC) is one of nine committees (Animal, Field Crops, Horticultural Crops, Food Processing, Rural Development, Agriculture and Food Engineering, Agricultural Economics, Pest Management, Soil Water and Air) reporting to the Ontario Agricultural Services Co-ordinating Committee (OASCC).

The OHCRSC endeavours to compile the thoughts and activities of 16 commodity sub-committees with 2 additional working groups. They are:

Agroforestry
Apiculture & Pollination
Apple
Berry Crops
Crucifer Crops
Ginseng
Grape & Wine
Greenhouse and Protected Crops[1]
Greenhouse Floriculture
Low Acreage & Special Crops[2]
Muck Crops
Nursery/Landscape & Turfgrass
Potato
Sweet Corn
Tender Fruit
Tomatoes

Working Groups

1. Mushrooms
2. Asparagus

The membership is made up of industry, government and universities representatives. The main OHCRSC is made up of 14 members with an additional 400 members making up the sub-committees.

Horticultural Crops - through its sub-committees it identifies and prioritizes research needs for crop production, including pest management, and makes recommendations to address research gaps, re-allocation of support or re-direction of current research effort.

MANDATE

Main Committee:

- To review reports submitted by commodity committees.
- To assess the requirements for horticultural crops research and services.
- To establish priorities for horticultural crops research and services.
- To assess progress in horticultural crops research and services.
- To present reports and recommendations to OASCC describing the needs for horticultural crops research and services including information in relation to:
  - cost-benefit;
  - research and service facilities and personnel required in the investigation(s);
  - location best suited for the investigation(s);
  - how funds might be obtained or freed to conduct new research and services;
  - operation of subcommittees.
- To consider and approve chairs, vice-chairs and members of subcommittees.

Terms of Reference:

- To prepare research and service summaries and to recommend research and services priorities in Ontario for appropriate horticultural crops.
- To disclose problems that face the appropriate industry which require investigations.
- To coordinate research and services planning and cooperation.
- To assess and suggest priorities for new programs and recommend which programs presently underway should be expanded or terminated.
- To estimate, where possible, costs involved in the conduct of new research and services programs and to supply cost-benefit information.
- To suggest, where possible, how funds might be obtained or freed to conduct new research and development.

OASCC STRUCTURE, DUTIES AND TERMS OF REFERENCE

ONTARIO AGRICULTURAL SERVICES COORDINATING COMMITTEE

A provincial committee, the Ontario Agricultural Services Coordinating Committee (OASCC) was formed in 1965, with four major subcommittees, namely, Field Crops, Horticultural Crops, Livestock, and Soil and Water. Later, four new major subcommittees were added: Agricultural Economics, Agricultural Engineering, Food, and Pest Control. In 1986 "and Services" was added to the names of all the major subcommittees, and two names were changed to reflect more closely the scope of their activities. A new mandate and structure for the Food Research and Services Committee was approved in January 1990, and in 1993 its name was changed to the Ontario Food Processing Research and Services Committee. In 1998-99 OASCC was restructured again to include the following 9 OASCC committees - Animal, Field Crops, Horticultural Crops, Food Processing, Rural Development, Agriculture and Food Engineering, Agricultural Economics, Pest Management, Soil Water and Air.

OASCC

Terms of Reference

1. Regular review of the broad aspects of agri-food and rural research, extension, and education in Ontario with the object of:

    a) facilitating intergroup communication and coordination at management levels;
    b) assessing immediate and future needs and developing proposals to meet them;
    c) advising on joint uses of available facilities and personnel; and
    d) contributing information and ideas bearing on regional and national policies affecting agri-food industry.

2. To carry out special assignments on behalf of CARC appropriate to the above objectives.

3. To meet at least annually and to report through a designated representative to the annual meeting of CARC. Summary reports shall be sent to the Chair of CARC with copies to the Deputy Minister of Agriculture, Food and Rural Affairs for Ontario.

ONTARIO AGRICULTURAL SERVICES CO-ORDINATING COMMITTEE

Ontario Animal Research & Services Committee
Aquaculture
Beef
Broiler
Dairy
Deer
Egg Layer
Equine
Fur Bearing
Goat
Pork
Sheep
Turkey

Ontario Field Crops Research & Services Committee
Cereal Crops*
Corn*
Forage Crops*
Oil & Protein Seed*
Pulse*
Tobacco*

Ontario Agriculture & Food Engineering Research & Services Committee
Crops
Food
Livestock
Rural Environment

Ontario Soil, Water & Air Research & Services Committee
Agrometeorology*
Soil Management*
Water Management

* includes technical working groups

Ontario Horticultural Crops Research & Services Committee
Agroforestry
Apiculture & Pollination
Apple
Berry Crops
Crucifer Crops
Ginseng
Grape & Wine
Greenhouse & Protected Crops*
Greenhouse Floriculture
Low Acreage & Special Crops*
Muck Crops
Nursery/Landscape & Turfgrass
Potato
Sweet Corn
Tender Fruit
Tomatoes

Ontario Food Processing Research & Services Committee
Dairy Products & Processing
Fruit & Vegetable Products & Processing
Cereal Grains & Oilseeds Products & Processing
Meat Products & Processing

Ontario Agricultural Economics Research & Services Committee

Ontario Pest Management Research & Services Committee
Technical Working Groups
Fruit Vegetables Tobacco & Ginseng Field Crops
Protected Crops Ornamentals & Turf
Ontario Weed Committee

Ontario Rural Research & Services Committee

INDUSTRY/SECTOR SCAN

MAJOR ACCOMPLISHMENTS

AGROFORESTRY

Research

A. Maple Sugar Bushes – ongoing projects

1. Literature reviews and guideline development. Dave Chapeskie, OMAFRA
2. Maple Experiment – Establishment of plots, treatment application and vegetation analysis. Dr. R.A. Lautenschlager, Ontario Forest Research Institute
3. Assessment of ice storm-induced crown damage and mitigative treatments on root starch levels, sap production and sugar content, and wound closure. Dr. Tom Noland. Ontario Forest Research Institute
4. Assessing micro-climate changes in ice damaged sugar maple stands. Dr. Bill Parker. Ontario Forest Research Institute
5. Monitor effects of ice storm damage on hardwood insect populations and disease. Dr. Taylor Scarr, Provincial Entomologist, OMNR.
6. Soil and plant analysis for post-damage management of sugar maple stands. Dr. Vic Timmer, University of Toronto.
7. Response of soil organisms and microbial-mediated processes to ice storm damage and treatments. Dr. Suzanne Visser, University of Calgary

B. Woodlots and Plantations

1. Literature reviews and management guidelines. Cathy Nielson, Science and Technology Transfer, OMNR
2. Determination of effects of ice damage on forests in eastern Ontario. Dr. Tony Hopkins, CFS and Tim Williams, Growth and Yield, OMNR.
3. Economic analysis of management options for ice damaged maple bushes, woodlots and plantations. Dr. Glenn Fox, University of Guelph, Dan McKenney, CFS.
4. Effects of ice storm damage on red pine insect populations. Dr. Sandy Smith, University of Toronto (and Krista Ryall)
5. Ecological effects of salvage. R. A. Lautenschlager, OFRI
6. ISFRATT integration package. R.A. Lautenschlager OFRI
7. Program coordination and communications. Cathy Nielson, Science and Technology Transfer, OMNR.

C. *University of Guelph, Agroforestry Research Group*

Completed thesis titles (M.Sc.)

1. James A. Simpson (1999). Effects of shade on maize and soybean productivity in a tree-based intercrop system.
2. Ping Zhang (1999). Nutrient inputs from trees via throughfall, stemflow and litterfall in an intercropping system.
3. Gordon Price (1999). Spatial and temporal distribution of earthworms in a temperate intercropping system in southern Ontario.
4. Maren Oelbermann (1999). Litterfall and nutrient fluxes across the terrestrial-aquatic ecotone in a rehabilitated riparian environment.

Referred journal articles published in 1999

1. Quantity and quality of autumnal litterfall into a rehabilitated agricultural stream. Oelbermann, M and A.M. Gordon, J. of Environ. Qual.
2. Effects of juglone (5-hydroxy-1,4-napthoquinone) on soil ammonification and nitrification. Thevathasan, N.V., A.M. Gordon and R.P. Voroney. Agroforestry Systems 44: 151-162.
3. Spatial and temporal distribution of earthworms in a temperate intercropping system in southern Ontario. Price, G.W. and A.M. Gordon. Agroforestry Systems 44: 141-149.
4. An economic analysis of market and non-market net benefits of a temperate intercropping system in southern Ontario. Dyack, B.J., K. Rollins and A.M. Gordon.

Service

1. Coordinated the 1999 Maple Summer Tour for OMSPA members and Northeastern U.S. maple producers. Cornwall, Ontario. Dave Chapeskie.
2. Provided and assisted with downlink sites for the Maple Production School, coordinated and broadcast via satellite from Cornell University. Dave Chapeskie and Todd Leuty.
3. Established the Maple Production Agriphone service, recorded 2 times per week during sap run and syrup processing. Todd Leuty.
4. Completed the cost of production analysis for maple syrup for Ontario conditions. Dave Chapeskie.
5. Helped to coordinate continuation of ice storm damage research in eastern Ontario. Dave Chapeskie.
6. Woodlot management workshops at Elmwood, Lindsay, Trenton and Kemptville, 1000 farmers and woodlot owners. Dave Chapeskie and Todd Leuty
7. Completed the, Annual cost of production analysis for commercial nut orchards. Todd Leuty, assistance by Mary Jane Combe. Applies to Persian walnuts, grafted black walnut cultivars (also referred to as 'The Old Walnuts'), pecans and sweet chestnut orchards.
8. Sweet-tree maple cloning trial (continued). Todd Leuty and Dave Chapeskie.

Infosheets completed (see OMAFRA agroforestry web-site):

1. Intercropping trees and annual crops.
2. Farm tile drains and tree roots.
3. A tree farmer shares some ideas. Assistance from Andy Dixon, Ailsa Craig, Ontario.
4. A list of walnut cultivars.
5. Walnuts for food versus walnuts for wood.

Video presentation to the National Workshop on Wild Ginseng Recovery.

- Farmed woods-grown ginseng can assist recovery efforts of threatened wild ginseng in Ontario. Todd Leuty

APICULTURE & POLLINATION

I. University of Guelph

A. Integrated management of bee mites

1. Efficacy of Apiguard for Control of Parasitic Mites: Apiguard™, a gel formulation of thymol, was tested in a second trial for efficacy against HBTM and VM. During Apiguard™ treatments, 76.3% of the VM dropped onto the bottom boards, as compared to 23.6 % in the control colonies. Given the results to date, further research on this product is not justified because it is less effective than either Apistan or formic acid for VM control.

2. Effects of Miticide on Drone Survival: The effects of CheckMite (Coumaphos) on the longevity of drones and the amount of semen in their seminal vesicles were studied. Treatment of bee colonies with CheckMite, Apistan® or control showed that the drone survival was best in the control colonies. It was worst in colonies treated with Apistan®. The CheckMite treated colonies had intermediate drone survival.

3. Comb Construction by Queenless and Queenright: Basic research was conducted to determine if queen mandibular pheromone (QMP) regulate drone vs. worker comb construction. Results showed that queenright colonies constructed predominantly worker comb in relatively large amounts. Queenless colonies produced significantly less comb, and almost exclusively drone comb. Queenless colonies, with QMP added, generally behaved like queenright colonies. The data is consistent with the conclusion that the type of cell constructed is influenced by the level of queen pheromones reaching the workers.

B. Sustainable Pollination for Ontario's Crops

1. Honey Bees and High Density Apple Orchard Pollination: Studies on honey bee movement in orchards have shown that most bees tend to restrict their movements to only a few trees, within the same row. It seems that honey bee foraging is not affected by apple variety. However, honey bee activity is influenced by bloom density and distance from the hives.

Combining the information on gene dispersal and bee movements, it appears that the latter is not a good indicator of the former because the genes move more than the bees. This finding is consistent with the idea that pollen transfer back at the hive is important.

2. **Bumble Bees and Greenhouse Tomato Pollination:** Research in commercial tomato greenhouses has shown that there is less bee loss and greater bee activity with the use of one of the less common plastic types (CT plastic) than with the other plastic types. Laboratory studies to determine if tomato quality is affected by various levels of pollination have been conducted. The results are being analyzed and will be reported in the near future.

3. **Highbush Blueberry Pollination:** Highbush blueberry flowers are variable in the depths of their corollas and the width of the aperture. Thus, some longer-tongued bees, especially bumble bees, are the most effective pollinators and more so than honey bees.

4. **Pickling Cucumber Pollination:** In 1999, genetic variability among several varieties of pickling cucumbers was identified with information provided by Bick's. Female cucumber flowers require up to 15 bee visitations to produce commercially acceptable cucumbers. Bee foraging behaviour decreased with increasing distance from bee hives through the day. Although bee activity was greatest within 75 metres from the hive, comparisons of fruit set and quality revealed no differences in plants located up to 250 metres away (the lengths of fields) from hives.

5. **Cucurbit (Squash And Pumpkin) Pollination:** Squash and pumpkin are pollinated in southern Ontario by a specialist bee, *Peponapis pruinosa*. This solitary bee nests in dense aggregations. The females emerge in summer co-incidentally as the crop blooms and forage on the flowers. This lasts about half a day, early in the morning and well before honey bees become active. A survey of farms throughout southern and central Ontario showed that the bee is widespread throughout those parts of the province, but probably absent in the north.

6. **Bumble Bees, Red Clover and Other Crops:** The 1999 research was on a red clover seed production field. Results from available data showed that the supplemental pollination by bumble bees and honey bees had a beneficial effect on seed yields in the experimental plots.

7. **Honey Bees and *Echinacea:*** Experiments were set up near Simcoe to determine if *Echinacea* is a good nectar and pollen source for honey bees. It was determined that it is both. At present, the seed heads are awaiting examination to determine effects of bee pollination. Pollen and honey crop contents from honey bees foraging on *Echinacea* have been collected for more detailed analysis for potential herbal value.

8. **Essential Oils for Mite Control in Honey Bee Colonies:** The following oils were fed to honey bees to determine their toxicity towards the bees; pinene, wintergreen, thymol, clove, cinnamon, and neem. The LC50's for cinnamon, clove, pinene, thymol, wintergreen, and neem were 150, 200, 1500, 100, 500, and 100 to 1000 ppm, respectively (the bees did not

take well to being fed neem oil). Phase II, the toxicity of the botanicals to mites, will be studied and the potential for micro encapsulated formulations being used as medicaments will be investigated.

II. Ontario Beekeepers' Association

A. Breeding, Maintenance and Marketing Tracheal Mite-Resistant-Hygienic Honey Bees

1. Breeding and Maintenance of Tracheal Mite-Resistant Honey Bee Stocks in 1999: Ontario bee breeders selected 221 honey bee colonies as potential breeders to be evaluated for tracheal mite resistance. The tracheal mite resistance bioassay was used. The top 25% of bee colonies, which had the lowest abundance and prevalence of tracheal mites in their tested progenies, were considered mite resistant and were recommended for use as a source of breeder queens. These selected queens were used to produce the subsequent generation of the Tracheal Mite Resistant-Hygienic stock.

2. Breeding and Amalgamation of the Hygienic Bee Trait into the Tracheal Mite-Resistant Honey Bee Stocks: Over 250 colonies from the 1998-1999 Tracheal Mite Resistant-Hygienic bees in Ontario were evaluated for hygienic behaviour in 1999. Colonies with more than 50% of the freeze killed pupae removed were recommended for use to produce hygienic bee stocks. This process of amalgamation of hygienic trait to the tracheal mite resistance in developed honey bee stocks has been used for three honey bee generations.

3. Augmentation and Marketing of Mite Resistant Honey Bee Queens in Ontario and Other Countries: The estimated number of queens produced from Tracheal Mite Resistant-Hygienic bee stocks in Ontario was 15,000 queens. Most of these queens were used for requeening bee colonies across Ontario. We actively promoted the Ontario mite-resistant stock in the US and Mexico. This campaign resulted in selling several hundred mite-resistant queens and eggs from selected breeders to beekeepers in the US and Canada. Several queens were exported to Mexico for evaluation.

4. Evaluation of Efficacy of Hygienic-Honey Bee Stocks in Removing Varroa Mites: The efficacy of hygienic bees in removing varroa infested pupae and in damaging adult varroa mites was determined in 18 bee colonies. Results showed that the average percent of immature mites in the total fallen mites was 33.3. The average percent of damaged adult mites in the total fallen adult mites was 21.9. The average percent of removed freeze killed pupae was 76.4. The correlation between the percent of immature varroa mites in the fallen adult mites and the percent of removed freeze killed pupae was 0.533 ($P< 0.01$). The correlation between the percent of damaged adults mites in the fallen adult mites with the percent of removed freeze killed pupae was 0.22 and was not significant.

. *Evaluation of the Integrated Pest Management (IPM) Program to Control Honey Bee Parasitic Mites*

1. Efficacy of Field Application of the IPM Program on Mites in Honey Bee Colonies: Honey bee colonies were sampled in May (170 colonies) and August (100 colonies). Bees were examined for tracheal and varroa mite infestations. The percentages of colonies with no detectable tracheal mite infestation in spring and summer bee samples were 59% and 55%, respectively. The percentages of honey bee colonies with 1-10%, and 11-100% tracheal mite infestation in the spring were 24 and 17%, respectively. In the summer samples, the percentages of honey bee colonies with 1-10%, and 11-100% tracheal mite infestation were 21 and 22%, respectively. The application of the IPM program succeeded in controlling the mites. We found that colonies heavily infested with tracheal mites were in three operations where beekeepers did not follow the recommendation of the IPM program.

2. Evaluation of Quality of Honey Bee Queens Produced in Ontario: Infection of queens with tracheal mites and nosema could increase the supersedure of queens in bee colonies. Queens provided by queen producers in Ontario were examined for tracheal mite infestation and nosema infection. The total number of sperms were counted in each queen. Results showed that only 3 queens supplied by 3 queen producers were infected with tracheal mites (1 mite/queen). Two queens were infected with nosema. These nosema infected queens were from the same queen producer who also had one queen infested with tracheal mites. The percentages of queens infected with tracheal mites and nosema were 4 and 2.7%, respectively. The average number of sperm per queen was 3.9 ± 1.5 million (Mean ±std). We found the average number of sperm (2.1 ± 0.7 millions (Mean ±std)) in queens provided by one queen producer was significantly lower than the rest of the other queen producers. These results showed that queen producers in Ontario produced healthy queens.

3. Efficacy of Fall Application of Formic Acid Single Application (*MiteAway*) in combination with Apilife Var and Apiguard™ on varroa mites: Efficacy of *MiteAway* pad, a combination of the *MiteAway* pad and one piece of Apilife Var, a combination of the *MiteAway* pad and Apiguard™, 2 pieces of Apilife Var, and Apiguard™ on varroa mites was determined in the fall of 1999. Results showed that Varroa mite mortality averaged 95.9% ± 0.78 in colonies treated with formic acid *MiteAway* pads, 91.35% ± 8.56 in those treated with a combination of *MiteAway* pads and Apilife Var, 88.75% ± 10.11 in those treated with a combination of *MiteAway* pads and Apiguard, 79.22% ± 20.32 in those treated with Apilife Var, and 74.77 in those treated with Apiguard. Two out of 4 colonies treated with a combination of *MiteAway* pads and Apilife became queenless. These results showed that Formic Acid is more effective against Varroa mites. Efficacy of Formic Acid in the fall increased when the pads were removed from the perforated vegetable bags 15 days after treatment and placing the pads back on the spacers for the rest of the treatment period.

4. Testing Wintering Systems for Providing Protection to Overwintered Bee Colonies in Ontario: A field evaluation of different methods of wrapping honey bee colonies for protection during winter months was conducted in 4 locations; South-western Ontario,

Northern Ontario, Eastern Ontario and South-central Ontario. Results showed providing protection to bee colonies helped bees to conserve food consumption over the winter months. Overall, the BD (Barry Davies) method was very consistent in all test areas, with respect to both temperature and humidity. The WW (Western Wrap) was effective in all areas except for the South-west, where the colonies experienced high temperatures. This may have resulted in significantly reduced cluster size. The VD (Vander Dussen) showed consistent temperature control, but humidity levels were consistently high in all test areas. The TW (tarpaper wrap) and CB (cardboard box) were not as effective as overwintering methods. The temperature over the bee cluster was significantly lower in the TW and CB systems in comparison to the temperature over the bee cluster in other tested wintering systems. For handling and time required to install the system, VD system required the least time followed by the CB, TW, BD. The WW required the longest time.

C. Innovative Quality Assurance: Honey Bee Pollination in Agriculture

1. **Pollination Symposium:** A pollination symposium was held in Guelph with beekeepers and farmers attending the symposium. Several topics were covered including pollination ecology of crops and honey bees, bee colony management and economics of pollination.

2. **Pollination Brochure:** A pollination brochure was developed and printed for education and promotion of bees for pollination in Ontario.

3. **Examination of Honey Bee Colonies in Pollination for the Development of a Seal of Quality for an Effective Pollination Unit:** In the 1999 season, 428 colonies rented for pollination were examined to determine strength and health. Comprehensive evaluation was conducted on 169 of these colonies. The survey results showed that the percentages of bee colonies with strengths of 0-<4, 4-<8, 8-<12, and 12-16 of frames of bees were 22.5, 37.4, 37.3 and 3%, respectively. The percentage of beekeepers that supplied colonies which met the recommended colony strength (4 frames of bees/colony) was 75%. Bee colonies generally were healthy, except in one case where the beekeeper provided approximately 50% of queenless colonies. In summer pollination, colony examination results showed that the percentages of bee colonies with strengths of 0-<4, 4-<8, 8-<12 and 12-16 frames of bees were 21, 58,17 and 4%, respectively. We found again that 75% of the beekeepers provided colonies which met the recommended strength.

D. Breeding Honey Bees Resistant to Varroa jacobsoni

In 1999, using the methods described in the *American Bee Journal*, 1998, 6:464-466 and 1999, 7:537-540, the varroa populations were monitored in 200 colonies. The bee colonies with the lowest varroa counts and highest scoring hygienic behaviour were used for the rearing of the new generation of queens. Research data for 1999 is being collected, analyzed and prepared for submission to the Ontario Beekeepers' Association.

APPLES

Two large chemical thinning trials were conducted in 1999. In the first study conducted in Middlesex county, the objective was to evaluate the efficacy of different thinning techniques and products on adjusting the crop load of Fuji apples to enhance fruit size and return bloom. The objective of the second study conducted in Clarksburg, was to evaluate the influence of timing, rate, product, and combination sprays of Carbaryl on the thinning of Northern Spy.

Two foil mulch demonstration trials were undertaken in 1999. One trial was in the London area and the other in the east. The purpose was to measure and observe the enhancement of fruit colouring by using a reflective material on the soil surface. These demonstrations did show the increase in quality fruit possible with the use of inexpensive reflective soil covers.

Evaluation of the use of tensiometers and Watermark™ sensors as grower friendly field tools to access soil moisture levels was conducted in the Georgian Bay area. A field trial was set up to determine the limitations to this instrumentation under minimal maintenance and limited servicing on two soil types.

Evaluation of late applied irrigation as a significant means of increasing fruit size was conducted in the Georgian Bay area. Mature Empire/M26 with a heavy fruit load were irrigated with 2.5 cm of water weekly for the month of August. Fruit size was compared to non-irrigated trees to determine if fruit size was enhanced by late irrigation.

A trial to evaluate the application of various growth regulator and leaf removal techniques to enhance the branch development of one year old Northern Spy/M.9 was conducted. Five treatments were applied to one-year-old trees in a nursery situation in an attempt to induce the trees to produce more branches and better crotch angles.

A pollination study was undertaken this year in cooperation with the U of G. The purpose was to study pollen movement in high density supported planting systems. To determine the quantity requirements for pollen to enhance seed count and set, and to determine the number of cultivars required to facilitate effective pollination at higher tree density. Studies are being continued on bee colony strength, possibly leading to a quality assurance program for hives rented for pollination purposes.

Regional testing of advanced AAFC, Summerland, BC apple selections planted in 1998 was continued this year. In addition to Simcoe and Cedar Springs, the Canada Apple Cultivar Trial was established at Clarksburg. The trial consists of a randomized design of 12 cultivars replicated 8 times. The objective of the trial is to a) evaluating the performance of advanced BC selections in and across Ontario b) measure their suitability for commercial orchards; and c) allow growers the opportunity to evaluate tree habit, vigour and fruit quality.

A Cost of Production Study is under way to better document the cost of establishing higher density supported planting systems now that more growers are involved. This study will not be complete until a large enough data base is assembles to improve accuracy.

OMAFRA has been maintaining provincial surveys of IPM adoption in the Ontario apple industry for a number of years. The percentage of growers/acreage using IPM practices (decision-making based on regular and frequent monitoring by IPM scout, consultant or grower) has steadily increased from 25% in 1992 to 35% in 1996 to an estimated 45% in 2000. This has led to a reduced use of pesticides, financial savings to growers and reduced environmental impacts.

The oblique banded leafroller, a pest resistant to OP insecticides in many parts of the province is responsible for significant economic losses in affected apple-growing areas. An IPM compatible strategy using "softer" pesticides and a degree day based monitoring system has been developed by OMAFRA and has been widely adopted by affected growers. Harvest injury has been reduced by 50% or better.

The OMAFRA, in partnership with the OAMC, released a new comprehensive manual, *"Integrated Pest Management for Ontario Apple Orchards"* in 1999. A Grow Ontario grant ensured that every grower received a free copy of the manual. A first ever IPM school was held on December 1st with international speakers and 89 participants attending. A series of interactive workshops to familiarize growers with using the IPM manual are planned for the winter of 2000.

Research by Dr. Mitch Trimble, AAFC, Vineland, on the use of border sprays has led to widespread adoption of the border spray techniques by Ontario apple growers. Border sprays are targeted specifically to summer pests, codling moth and apple maggot. Growers have realized significant dollar savings and pesticide load on the environment has been reduced.

A three-year demonstration project, conducted by OMAFRA field staff, used new IPM compatible chemistries to reduce use of broad-spectrum pesticides. No significant increase in pest activity and no emergence of new pests was encountered, paving the way for further development of further sustainable IPM techniques including use of biological control agents and cultural practices to further reduce dependency on organophosphate and pyrethroid insecticides.

Greater interest has been shown in high density support systems using size-controlling rootstocks. Grower transition towards supported systems on semi- and dwarf- rootstocks has numerous benefits including: a) better fruit quality b) better spray targeting; c) higher precocity and production per unit area; d) greater ability to shift with cultivar trends, and; e) more efficient use of land.

Chemical thinning and utilization of plant growth regulators are necessary to optimize fruit size and quality. Research on chemical thinners such as Carbaryl, NAA, and Accel has led to a greater awareness and adoption of these products by growers. In many instances, this has led to a reduction in hand thinning offer considerable labour saving costs to growers. More recently, research on ReTain (AVG) as an harvest management tool has helped growers reduce preharvest fruit drop and improve fruit quality in long-term storage. Research on Ethephon sprays to enhance return bloom of bearing trees and enhance precocity of non-bearing trees is nearing completion.

Research on the biocontrol of fungal rot of apples has shown some promising results. Four isolates of *Pseudomonas syringae* collected from apple trees were evaluated as biocontrol agents for controlling blue mold (*Penicillium expansium* and gray mold (*Botrytis cinerea*) of postharvest apples. In a semi-commercial experiment conducted under 4oC for42 days and 18oC for 12-20 days, application of one stain of *Pseudomonas syringae* (MA-4) to blue mold-inoculated apples significantly reduced disease incidences of blue mold by 63-70% on 'Empire' and 50-69% on 'Red Delicious'.

The Food Inspection Branch, OMAFRA, continues to provide support services to the Ontario apple industry in a variety of ways.
These include:

- providing equipment, auditing, and training services in support of the Ontario Apple Marketing Commissions (OAMC) controlled atmosphere storage program;
- supporting the OAMC quality improvement initiatives through drafting of memorandum of understanding that will provide for appointments, training and auditing for OAMC inspection staff;
- supporting the apple cider segment of the Ontario industry through the establishment of a interagency group including Health Units, Ministry of Health, the OAMC, the Canadian Food Inspection Agency, the Ontario Sweet Apple Cider Association and OMAFRA to prepare and distribute production and food safety material to the Ontario agricultural community;
- provide an impact device for loan to packers to assess fruit quality (bruising) on the packing line and,
- the continued implementation of a food safety monitoring program.

EXTENSION PUBLICATIONS AND OTHER ACTIVITIES:

A partnership has been formed between the Apple Team and the Ontario Apple Marketing Commission for the dissemination of apple grower production information. The Orchard Network Newsletter, which is an extension publication, is now an enclosure in the "Pick of the News". In 1999 a total of total of 22 (4 more) pages of production information, prepared by extension, was sent to all commercial apple growers in the province. This partnership remains a very efficient way of informing all commercial growers of technical production information.

Extension personnel participated in over 120 hours of presentation to grower groups on cultural issues in 1999. This list of speaking engagement includes: the Apple Day at the Ontario Horticultural Crops Conference, various grower apple days across the province, thinning workshops, apple study groups, twilight meetings and tours.

Extension also maintained the Agri-phone system for the 1999 growing season. This system is ideal for the dissemination of real time insect, disease and cultural information to commercial growers. The agri-phone messages are now faxed for a fee to interested parties and the information is also put immediately on the OMAFRA website.

The Apple Team is cooperation with the OAMC is also deeply involved in the Cultivar Demonstration trials slated to begin in the spring of 2000. In ten grower locations across the province new cultivars will be evaluated to determine if they have a commercial potential in the Ontario Apple Industry. This evaluation will be done in consort with the chain stores to be sure that new selections have some market acceptability from the start.

The Apple Team has been instrumental in generating grower interest in the Solaxe System of tree training. Plantings will soon appear in eastern Ontario as growers investigate this type of tree training.

BERRY CROPS

Agriculture and Agri-Food Canada (AAFC)

Greenhouse and Processing Crops Research Centre, Harrow

1) **Canadian Clonal Genebank**. *Margie Luffman*

The Canadian Clonal Genebank Program maintains a collection of small fruit indigenous germplasm and named cultivars. The collection includes *Fragaria,Rubus ,Ribes ,Vacc inium* and *Sambucus*. This material is held in pots in protected culture. It is distributed free of charge to small fruit workers for breeding and research purposes.

The indigenous *Rubus* collection and the entire *Ribes* collection are established in a field planting where evaluations will be done. A portion of the *Fragaria* indigenous germplasm is also established in the field for evaluation of various horticultural traits. Most of the *Fragaria* collection had been previously evaluated at Trenton, Ontario during the early 1990's. This more recent planting includes germplasm not previously evaluated plus material that is notable for certain valuable properties including disease resistance, large fruit size and fall flowering tendencies.

Southern Crop Protection and Food Research Centre (SCPFRC), Vineland Station

1) **Response of Strawberry Selections to Root-lesion Nematode.** *John Potter and Adam Dale*

Currently, research on nematodes and strawberries involves a test of 49 advanced breeding

lines and two standards (Veestar, Annapolis) against the root-lesion nematode *Pratylenchus penetrans*, to determine the resistance/susceptibility and tolerance/intolerance of the lines. The test is being run in nematode-infested greenhouse groundbeds at AAFC SCPFRC-Vineland.

2) **Alternatives to Fumigants.** *John Potter, Mikio Chiba, Qing Yu and Rong Cao*
The study of mustard bran as a nematicide was discontinued in early spring 1999, following the withdrawal of our commercial partner from the project. The team working on this study at SCPFRC-Vineland has been disbanded. Any future interest in mustard bran as a nematicide can be directed to Dr. Mikio Chiba - contact data available from J. Potter.

University of Guelph

Department of Environmental Biology, Guelph

1) **Dew Period, Temperature and Sunlight in Relation to Biocontrol of Botrytis in Strawberry Flowers and Leaves.** *John C. Sutton*
Gliocladium roseum (GR) performed as effectively or better than fungicides in field tests conducted during 1989-1994. The process of commercial development of GR is under way. Unlike fungicides, GR respond markedly to microclimate variables. Experiments was set up to: quantify relationships of night-time humid periods and temperature to establishment of GR in strawberry flowers and leaves, and the biocontrol activity of GR against Botrytis; and determine relationships of daytime periods of sunlight and low humidity to survival of GR on strawberry flowers and leaves.

Overall it was concluded that *Gliocladium roseum* is highly effective against Botrytis in strawberry provided that the inoculum is not inactivated by sunlight and has an adequately long humid period to allow the fungus to establish inside the leaves or flowers. GR needs a humid period of at least 8 hours for moderate to good establishment and for good control of Botyrtis when temperatures are warm (20 to 24°C) and 12 hours at 16°C. When the humid periods are short (< 8-10 h) and nighttime temperatures low (mean hourly temperatures < 16°C) only moderate or poor control can be expected.

Department of Plant Agriculture, Horticultural Science Division, Guelph

1) **Developing DNA-based Diagnostics for Fungal Diseases of Strawberry**. *Judith Strommer, Wendy McFadden-Smith (Vineland) and Annette Nassuth (Dept. Of Botany)*
The following was accomplished with support from the Ontario Berry Growers Association supplemented with funding from OMAFRA. DNA primers have been designed for identification of fungi causing red stele (*P. fragariae*), crown and leather rot (*P. cactorum*) and anthracnose (*C. acutatum, fragariae* and *gloeosporioides*) of strawberry. For the most part, primers have been tested successfully, and modified as necessary, using pure isolates of the fungal pathogens. The *C. gloeosporioides* primers carry some cross-recognition for other *Colletotrichum* species, but this is not expected to be a serious problem. Positive control primers have been tested successfully with strawberry DNA. We have demonstrated our ability to multiplex control and test primers on mixed DNA samples and verified our ability

to detect minor quantities of fungal DNA mixed with strawberry DNA. We have initiated efforts to coordinate our procedures with those of Annette Nassuth, to facilitate development of tests which can simultaneously identify fungal and viral pathogens.

Our plans for 2000 include: developing primers which successfully and specifically recognize *P. cactorum*; quantifying the minimal fungal DNA required for a positive test, using mixtures of fungal and strawberry DNA; testing our primers on a greater number of isolates for each pathogen and; determining the limits of our ability to identify pathogens of interest using diseased strawberry plants as a DNA source. We plan to continue working with Annette Nassuth to develop a multiplex system for combined viral and fungal diagnosis.

2) **Raspberry Breeding**. *J.A. Sullivan*

The raspberry breeding program seeks to produce new cultivars and germplasm with high yields of quality fruit and good winterhardiness levels. Winterhardiness is an important selection criteria as it will contribute to wide adaptability of cultivars and stable yields over time. In the crossing program, germplasm from major raspberry-growing areas have been used as sources of valuable genes in production genetic backgrounds. Selections are being propagated for wide area testing.

3) **Berry Crops Management**. *J.A. Sullivan, J.E. vanden Heuvel, and S. Couling*

i) An intensive study was completed to compare three trellising systems at four cane densities in summer bearing red raspberry. The three systems compared were hedgerow, V-trellis and single-sided shift trellis. The V-trellis system produced the highest yields at all but the highest cane densities. The single-sided shift trellis could not be adapted to red raspberries due to the presence of vigorous primocane growth which interfered with the dynamic movement of this system. Yields of raspberry trained to the shift trellis were lower than the V-trellis. Picking efficiency of the shift trellis was not greater that the other two systems.

ii) A study was started to improve the yield potential of strawberry by enhancing the microclimate during flower bud initiation period in the fall. Floating row covers are being applied at weekly intervals during the fall starting in mid September. Floating row covers are known to increase temperatures under the cover to improve the rate and duration of flower initiation. There should be a direct impact on yield the following season.

4) **Strawberry Genetics and Biotechnology**. *J.A. Sullivan*

i) The synthetic octoploid system was refined to facilitate the transfer of genes from lower ploidy species to the cultivated strawberry. An extensive crossing and chromosome doubling program resulted in several hybrids at the diploid and tetrapoid levels. These hybrids were then used to create synthetic octoploids. Introgression has begun to hybridize synthetic octoploids and strawberry cultivars to introgress genes from the wild species into the cultivated types.

ii) Research continues to develop an Agrobacterium mediated transformation system for the Ontario strawberry. Kanamycin and gus-genes have been inserted and are expressing.

Confirmation of transformation will be done using southern blots.

Department of Plant Agriculture, Simcoe

1) **Strawberry Breeding.** *Adam Dale and Linda Packer*
Two selections 53M54 and 32R11 are being propagated for release. These selections are late fruiting with good fruit qualities and were selected from a group of 13 selections trialed at 17 University of Guelph and grower sites throughout the province. We hope that material will be available for growers in 2001 or 2002. Two other selections, 32R14 and 67K74, are being propagated for release at a later date.

Four selections have been propagated for regional/grower trials in 2000 and a further 13 selections are in various stages of micropropagation and virus-testing for trials from 2001.

2) **Ornamental Strawberries.** *Adam Dale and Alan Sullivan*
Two ornamental strawberry selections, 103C2 and 103D34, have been identified to be released in 2002 or 2003. They are derived from synthetic octoploids, SO1 and SO2 made by Dr. Bill Evans and have attractive rugose foliage and showy white flowers that are presented above the foliage. Plants will be virus-tested this coming year.

3) **Raspberry Production in Greenhouses.** *Adam Dale, Kristen Bell Samson and Linda Packer*
Four varieties have been identified and recommended to growers for greenhouse production: summer-bearing varieties, Nova and Tulameen, and fall-bearing varieties, Autumn Britten and Polana. Research has shown that the fall-bearing varieties can be fruited for three years without chilling to break bud dormancy.

In March, a workshop was organized to transfer the technology to growers. This meeting was attended by 30 growers and extension personnel. Most of the people attending came Ontario although there were participants from Quebec, British Columbia and Michigan.

4) **Highbush Blueberry Irrigation x Variety Trial.** *Adam Dale and Linda Packer*
Total yields from first five harvests the cultivar x irrigation experiment has so far shown no treatment differences. However, interaction between annual yields and irrigation demand treatments has been highly significant.. Yields for the daily irrigation treatment were the lowest at the start of the experiment and have been the highest for the last two years, whilst the tensiometer and WISP model treatments started off as the two highest treatments and have been the two lowest treatments for the last two years.

5) ***Fragaria virginiana.*** *Adam Dale and Linda Packer*
Reconstituted *Fragaria x ananassa* selections were fruited in rows for the first time this year. Two selections from the cross *F. chiloensis* 'Pigeon Point' x *F. virginiana* 'Montreal River 10' had extremely large fruit. The selection with the largest fruit averaged 4.2 gm compared

to 6.1 and 6.9 gm for two plots of 'Veestar'.

6) **Yield Component Analysis in Raspberry**. *Adam Dale and OMAFRA Berry Team*
This year, 14 raspberry blocks throughout the province were examined for yield component analysis. Total potential yields ranged from 28.9 t/ha to 5.4 t/ha. Much of the variability could be accounted for by differences in row spacing and cane number within the row. About one-third of the blocks had noticeable yield losses from cane blight.

Department of Plant Agriculture, Vineland

1) **Sensory Evaluation of Processed Strawberries in 1998-1999**. *George Chu and Adam Dale*
Strawberries were received in June, 1998 from Simcoe Research Station. The visual appearance and taste of unprocessed strawberries were evaluated by our laboratory upon receiving and the results were recorded. Thirty-five (35) cultivars of strawberries were cryogenically frozen (IQF) by dipping into liquid nitrogen; whereas twenty-eight (28) cultivars of strawberries were sugar-packed. All the processed strawberries were stored at -25 °C for seven months. The frozen strawberries were thawed and were evaluated by a trained sensory panel with respect to appearance, colour, flavour and overall appearance. A numerical score from 1 to 9 was assigned to the sample with 1 being the worst and 9 being the best sample. Three cultivars were ranked high in frozen sugar packed strawberries as well as in IQF strawberries. They are ME-9, 32R153 and 37G19. Three cultivars (29G88, 21K74 and 56M70) were being ranked low in both IQF and frozen sugar-packed.

2) **Pressing of Strawberry Juices using Various Degree of Red and Green Berries Combinations**.*Ge orge Chu and Adam Dale*
The objective of this experiment is to prepare strawberry juices using various degree of red and green berries combinations. Two varieties of strawberries ('Honeoye' and 'Redcoat') were mechanical harvested from growers in Simcoe. Some of the berries were mechanically recapped to remove the stems and caps from the berries before juice pressing. Some of the berries were used as is, after mechanical harvested for juice pressing. The juice pressing were conducted in the Horticultural Products Laboratory at Vineland Station. The recapped strawberries were sorted to remove rotten fruits and prepared various degree of red and green (10% green, 30% green, 50% green and 70% green) combinations for further juice pressing. There is a slight decreasing trend on juice yield with increasing percent of green berries being used. The juice yield for non-recapped strawberries was higher in both varieties as there was less broken berries which account for the loss of juice during storage prior to juice pressing.

Kemptville College

1) **Strawberry Variety Trials**. *J. Madill*
i) Replicated Trial 1996- Berries were harvested for overall yield and berry size distribution in 1999 for the third and last time. Results to be reported to the growers shortly. Trial now

plowed.

ii) Observational Trial 1997 - A two rep observational trial of 20 entries (supplied by Adam Dale) was established in 1997 with yield and berry size distribution officially recorded for the last time in 1999. Trial was not plowed, but rather left for further observation.

iii) Replication Trial 1998 - A four rep observation trial of 12 entries was harvested in 1999 for yield and berry size distribution. The 1999 season was pronounced by an extended hot spell resulting in a pronounced detriment to some varieties. Results to be reported to the growers shortly. Trial to run two more seasons.

iv) Replicated trial 1999 -A four replication trial of 10 entries was established in 1999.

Note: In all of the replication trials the choice of varieties was reflective of grower requests

2) **Mulch Trial and Herbicide.** *W. Asbil*

A block of Veestar was established to compare mulches. Conventional straw mulch will be compared with flax straw, treatments being long and short flax, retted and unretted flax straw. Comparisons will include bare treatment (no straw). Straw will be applied during early November 1999.

An additional establishment of Veestar is available for use in the spring of 2000 for a herbicide trial.

Cedar Springs Research Station, Ridgetown College

1) **Weed Control in Strawberry**. *F. Tardiff and J. Zandstra*

Trials to identify and evaluate herbicides for minor use registration on strawberries continues at Cedar Springs. Dual, Frontier, Prowl, Blazer, Reflex, Goal, and Select are presently being evaluated on the variety Kent. Yield data was collected on trials planted in 1998, and another trial was established in 1999.

2) **Strawberry Variety Trials**. *J. Zandstra and A. Dale*

An observation variety trial which was established in 1997 was harvested again in 1999. This trial contains 20 numbered selections from the Ontario strawberry breeding program, with Veestar, Governor Simcoe and Kent as standards. The selection 54M56 looks promising (vigorous plants, fruit has good color, firmness and flavor).

3) **Raspberry Variety Trials**.*J. Zandstra*

Summer bearing observation trials which were established in 1997 were fruited for the first time in 1999. This trial contains numbered selection from New Jersey (6), New York (2), Guelph (8), as well as Tulameen, Qualicum, Malahat, Nova, Glen Magna, Glen Ample, and Lauren.

Fall-bearing observation trials which were established in 1998 were not fruited due to poor stands in some of the plots, which were re-established in the spring of 1999.

New Liskeard Agricultural Research Station (NLARS)

1) **Berry Crop Observation Trials.** *B. Hughes and C. Keith*

Twenty Simcoe selections and 12 cultivars planted in observation trials in 1997, were evaluated in 1999 for yield and quality. This was the last year for this trial. Evaluation of the five New Liskeard selections made in 1995 and 10 selections made in 1998 continues in 10-plant plots.

2) **Breeding Winterhardy Strawberries.** *B. Hughes and A. Dale*

16NL11 continues to look promising. 16NL11 was established *in vitro* and plants are being propagated in Simcoe for grower trials in the north starting in 2000. Northern Ontario Heritage Fund Corporation and OBGA funding was obtained to continue this work for three years. A small number of seedlings were established in New Liskeard in 1999. Seedlings from New Liskeard parents will be planted in 2000 for selection in 2001.

3) **Strawberry and Raspberry Micropropagation.** *B. Hughe s and W. Cook*

i) The SPUD Lab maintained 32 strawberry selections for the Department of Plant Agriculture in Simcoe. Five new selections were put into culture in 1999 and nine selections were shipped to Simcoe for establishment for virus testing.

ii) Over 1700 strawberry plantlets of 12 cultivars were produced for the screenhouse of the Ontario Plant Propagation Program in 1999. The SPUD Lab currently maintains 19 strawberry cultivars for the Plant Propagation Program. 6,000 *in vitro* raspberry plantlets were produced in 1999. These will be shipped to the propagators as dormant plug plants. As the SPUD Lab will no longer be producing *in vitro* raspberries for the propagators, the raspberry holdings were sent to the Canadian Clonal Genebank in Harrow.

Service

1) **Minor Use Registrations.** *OMAFRA Berry Team (Pam Fisher, Woodstock; Leslie Huffman, Harrow; Annette Verhagen, Harrow; Anne Verhalen, Ridgetown; Paul Goodwin, Simcoe; Maribeth Fitts, Vineland; Tom Clarke, Bradford; Marg Appleby, Brighton; and Kevin Schooley, Kemptville).*

Nine requests for Minor Use registrations for herbicides on highbush blueberries were submitted this year: Lexone, Sencor, Dual Magnum and Goal for year of planting and established plantings; and 2,4-D amine for established plantings.

Also, the request to register Dual Magnum for year of planting of strawberries was submitted this year, since this new formulation was finally registered in Canada. This makes a total of six MUPPs in the system for newly-planted strawberries: Frontier, Blazer, Goal, Reflex, and Prowl as well as Dual Magnum.

A cover crop demonstration trial allowed us to test Poast and Excel on marigolds in support of John O'Sullivan's minor use research.

2) **Estimated Establishment Costs and Costs of Production for Raspberries and**

Strawberries in Ontario. *Mary Jane Combe and Pam Fisher, OMAFRA*

Mary Jane Coomb updated the cost of productions for strawberries and raspberries in 1999 with input from the berry team. This is the first real update since 1992. The budgets will be available from all OMAFRA offices and posted on the Internet shortly.

3) **Raspberry Yield Analysis**. *Adam Dale, University of Guelph and the OMAFRA Berry Team*

The berry team is working with Adam Dale to evaluate the yield potential of raspberry plantings at different locations across Ontario. Yield analysis was conducted at 14 sites in Ontario in 1999. Adam Dale summed up the results and will present the results at the OBGA meeting in 2000. The project will be continued in 2000. Several conclusions, based on the 1999 results, will help direct our extension efforts in 2000. Cane blight was found frequently and is a major disease on raspberries. The data from some fields showed that it is possible to achieve high yields. Row spacing and cane number have a significant influence on yield. Growers who use wide spacing to accommodate equipment sacrifice considerable yield.

4) **Workshops.** *OMAFRA Berry Team*

Summer Workshops for growers were organized around the theme of "Diagnosing Berry Problems". Information was prepared and presented on insects, diseases, herbicide injury and nutrient deficiencies. There were six workshops held, near Chatham, Brantford, Brampton, Brighton, Kemptville, and Sudbury. Approximately 135 growers attended. Ninety percent of these growers responding to a meeting evaluation reported that the information was useful and would help improve diagnosis of berry disorders on their farm.

5) **Publications and Newsletters** *Pam Fisher, Kevin Schooley, OMAFRA Berry Team and Adam Dale*

Publication #360, *Fruit Production Recommendations*, will be re-printed in 2000. The berry sections were reviewed and extensive revisions made. The information on berry crop nutrition was re-written and will be published after approval by the Ontario Soil and Water Management Committee. Notes on insect and disease control were updated for currants and gooseberries, strawberries and raspberries.

Adam Dale submitted publication #513, *Growing Strawberries in Ontario*, in April 1999. We are now working with the desktop publisher on the final version.

The two OMAFRA newsletters for berry growers, the *Berry and Vegetable Informer*, edited by Kevin Schooley, and the *Western Ontario Berry Grower,* edited by Pam Fisher, will be combined into the *"All Ontario Berry Grower"* and published in the Grower, beginning January 2000.

The Berry Agriphones in Ontario continued to serve growers during the growing season. These weekly messages are available by phone, fax, email and Internet and continue to be our most important method of sharing pest management and production information with growers.

6) **Internet Content Development** *OMAFRA Berry Team*

The berry index page at http://www.gov.on.ca/OMAFRA/english/crops/hort/berry.html was

greatly expanded to include listings by crop and discipline. As well the BerryLinks feature at http://www.gov.on.ca/OMAFRA/english/external_links/croplink.htm#Berries was expanded and sorted by crop, now listing 31 external links rated as excellent for berries.

Berry information packages, containing basic production information and sources, as well as specific information for strawberries, raspberries and blueberries have been posted at http://www.gov.on.ca/OMAFRA/english/crops/facts/berrybasics.htm.

The following fact and infosheets have been posted: Blueberry Maggot in Ontario; Chilling Injury of Horticultural Crops; Herbicide Injury Symptoms in Berry Crops; Tunnel Forced Air Cooler for Fresh Fruits and Vegetables; Bird Netting Suppliers (Partial List); Blueberries for Home Gardens; Ontario Cranberry Industry; Biennial Raspberry Production; Identification of Diseases on Strawberry Fruit; and Strawberry Leaf Diseases.

Berry agriphone messages for Western Ontario and East-Central Ontario were posted every week. Five What's Hot articles were posted in 1999.

7) **Berry Team Variety Trials.** *OMAFRA Berry Team*

Observation trials were planted at five grower locations as part of a berry team project to demonstrate new strawberry varieties in Ontario. Plants were purchased with the assistance of the growers and the OBGA. Plants were packaged, stored and shipped through Strawberry Tyme Farms.

The growers and locations for these plots are: Rudy Heeman, Thorndale; Rob Chesney, Innerkip; Brian Durst , Fonthill; Morris Gervais, Barrie; and Lee Etherington, Peterborough. Fifteen varieties, Sable, Cabot, Evangeline, Brunswick, G19, Mira, Winona, Latestar, Northeaster, Delmarvel, Mesabi, Primetime, Jewel, Joliette and Chambly, were planted in 25 or 50-plant plots. At the Innerkip site, half the plants were planted in a matted row system, the other half were planted on a raised plastic bed in early July.

Plots were observed by berry team members occasionally throughout the season, and notes will be complied on leaf diseases, establishment, etc. Next spring, observations will be made on yield and fruit quality.

8) **Cover Crop Trials**.*OMA FRA Berry and Vegetable Teams*

An on-farm trial was initiated by the OMAFRA Berry and Vegetable Teams in 1999 to look at certain cover crops that have shown nematode suppressing abilities in Ontario research plots. Marigolds, forage pearl millet and sorghum were planted in late May at seven farm locations. Funding for marigold seed was provided by OBGA. Each cover crop treatment was replicated twice and compared with a weedy check area. Cover crops were planted using available seeding equipment at each site. Soil was sampled prior to planting and again at the end of the growing season to compare nematode numbers under each treatment. Plant biomass and plant stands were calculated in early July at six of the seven locations. Data

calculations from the 1999 trials are underway and the results will be presented early in 2000.

9) **Cranberry Pest Survey.** *Kevin Schooley, OMAFRA*

Kevin Schooley monitored two new cranberry operations to see what pests were present. Pests were detected using pheromone traps, sweep nets and observations. Low numbers of sparganothis fruit worm, cranberry girdler, and cranberry fruitworm were detected. Growers were trained in monitoring techniques and will continue monitoring on their own.

10) **Food Safety**. *OMAFRA Berry Team*

An information package on food safety for berry growers was prepared and presented at the Ontario Horticultural Crop Conference (OHCC) 1999, and circulated to all OBGA members. An OMAFRA food safety team was formed to address the information gaps on this topic. A workshop on food safety is planned for fruit and vegetable growers at the OHCC 2000.

11) **Plant Propagation Program.** *OBGA Achene Committee, Adam Dale, Becky Hughes and Margie Luffman*

Adam Dale continues to provide expert support to the Ontario plant propagation program and the Achene Committee. Becky Hughes and Margie Luffman provide technical expertise and Nuclear disease-tested plant material for the program.

12) **Ontario Coordinated Berry Crop Cultivar Trials 1998 Report.** *A. Dale, B. Hughes, J. Madill, A. Sullivan, S. Wang, S. Couling, L. Packer, J. Stewart.*

The results of the strawberry, raspberry, currant and blueberry cultivar trials run through the Ontario Coordinated Berry Crop Trials at four research stations across Ontario are summarized in this publication. This includes field observation and replicated yield trials, and some greenhouse trials. The publication is available from the OBGA.

CRUCIFER CROPS

1. Registration of Dual for cole crops.
2. Registration of Devrinol for cole crops.
3. Registration of Lontrel for cole crops and some Asian greens.
4. Publication and distribution of 2 factsheets on black rot and clubroot from the research station at St. Jean sur Richelieu, Quebec
5. Completion of the black rot literature review.

GINSENG

1. AAFC, Delhi: Quintozene use patter studies (to be analyzed this fall) will result in better understanding of residue issues.
2. AAFC, Delhi: URMULE trials have led to submission of to PMRA for TOPAS against Cylindrocarpon and Rhizoctonia. Other trials are being undertaken on Quadris and Sovran.
3. AAFC, Delhi: Soil mulching trials have indicated that certain bark mulches reduce the

incidence of disease.

4. AAFC, London: The use of a rapid detection method for Cylindrocarpon in ginseng is near completion. This will enable growers to identify this fungus and take appropriate measures.
5. AAFC, Delhi: Biocontrol agents have been identified for the control of seed decay.
6. AAFC, London: the development of micropropagation techniques will enable the strain selection program to move forward at a faster rate.
7. AAFC, Delhi: Results from fertilizer trials will allow the setting of base fertility recommendations.
8. AAFC, Delhi: Soil compaction studies have shown that root shape can be modified to better fit market demands.
9. OMAFRA: A comparison trial of ginseng sprayers will allow growers to make informed choices for better disease control.
10. OMAFRA: A series of grower disease workshops has allowed growers to better understand the processes affecting garden health.
11. OMAFRA: The new edition of Publication 610 has made available a colour reference of disease symptoms and life cycles.

GRAPE AND WINE

A. RESEARCH

Location acronyms: UG - University of Guelph (Guelph, Ridgetown, Alfred)
CCOVI - Cool Climate Oenology and Viticulture Institute at Brock University
AAFC - Agriculture and AgriFood Canada (Vineland, St. Jean QC, Sidney BC)
KCMS - Ker Crop Management Services
BellAssoc - K. Bellamy and Associates

1. The rapid RT-PCR method of surveying various difficult-to-detect viruses (RSPaV, GLRaV-3 and GVA and B) has been successful using 7 scion varieties and 3 rootstocks (Paroschy/Chateau des Charmes) and tissue from all parts of the growing season and is a step closer to commercialization (Nassuth/UG, Johnson/AAFC).
2. Commercially funded (Zeneca Agro, Dow Agro, Tomen Agro, BASF, Novartis) fungicide efficacy trials have been positive and are a very important step in the Canadian registration package requirements (McFadden-Smith/UG).
3. Postharvest treatment of powdery mildew was successful in reducing cleistothecia viability and ascospore production the following spring (McFadden-Smith/UG)
4. The California risk index model for powdery mildew was not accurate for the first primary infection and the temperature parameters will be revisited and retested in 2000 (McFadden-Smith/UG).
5. Trellising methods (Scott-Henry vs 4-cane Kniffin) reduced canopy density, reduced the incidence of powdery mildew on the clusters and downy mildew on both clusters and leaves, and delayed the downy mildew epidemic. Pesticide volume was also reduced by 45% because of the reduction in canopy size. Hand pruning versus machine pruning in Concords also reduced incidence of Phomopsis on leaves and petioles in Concord grapes (McFadden-Smith,

Wearing, Fisher, Hall/UG).

6. Hot water treatments of finished nursery stock has successfully reduced the titre of *Agrobacterium vitis* (*A. vitis*) without affecting the viability of 15 of 16 grapevine cultivars, Merlot being the exception. Commercial scale tests will follow graft take and vigour of grafted scion and rootstocks in the field (Stobbs/AAFC; OGGMB; nurseries).
7. A rapid bioassay was developed to detect the presence of *A. vitis* using Cabernet franc, Auxerrois and Cabernet sauvignon as the best indicators (Stobbs, Whybourne/AAFC)
8. Chardonnay and Riesling vines were inoculated with various biocontrol agents, planted in the field and then the plots inoculated with *A.vitis* to establish the protective ability of these antagonists under field conditions (Stobbs, Whybourne., VanDriel/AAFC).
9. A RAPD_PCR technique has been developed for the differentiation of strains of *A. vitis*, some of which are pathogenic and some antagonistic (Stobbs, Whybourne., Pasquale/AAFC)
10. Genes are being screened from F2/5 *A. vitis* to discover which play a role in protecting grapevines from pathogenic *A. vitis*. When identified, these will be introduced into non-pathogenic, non-*Agrobacterium* related bacteria that are common to grapevine to act as a biocontrol agent with little risk of reverting to a pathogenic role (Cuppels, Stobbs, Walker/AAFC).
11. Transferring leaves has been shown to be a practical method for introducing predatory mites into Ontario vineyards for the biological control of European red mite (ERM).contol (Marshall, Lester/AAFC)
12. A resistant strain of predatory mite (*Typhlodromus pyri*) was found to establish effectively in Sevin sprayed vineyards, reduce the population of ERM and to also overwinter successfully (Marshall, Lester/AAFC).
13. The success of Sovran for powdery mildew control on both leaves and clusters was tempered by the failure of both Quadris and Nova on leaves and Nova on fruit, reinforcing the need for a choice and a balance of fungicides in any spray programme (Northover/AAFC).
14. Stylet oil was successfully used to prevent powdery mildew on the fruit cluster and reduce ERM populations without reducing Brix readings of the fruit if the preharvest interval was at least 60 days (Northover/AAFC).
15. Foliar application of nutrients is being tested in conjunction with fertilizer suppliers (Greensides/UAP, Galin/HydroCanada), commercial testing laboratories (Patterson/A&L Labs), growers (OGGMB) and nutrition researcher (Derkacz/UG).
16. Four years of conditioning of heavy clay soil with paper manufacturing based biosolids (Donohue, Thorold) has been successful in increasing organic matter and not adversely affecting the levels of any minor nutrients or heavy metals (Derkacz, Fisher/UG).
17. Vegetative growth of potted Concord grapevines was improved with the addition of paper manufacturing based biosolids (Donohue, Thorold) to native soil (Kennedy, Derkacz, Fisher, Veroney/UG).
18. Bird predation studies have been initiated to identify feeding patterns of various species (Berry-Wade/BROCK). Starlings have a daily and seasonal pattern of feeding. Matching this pattern with an accurate assessment of bird damage and the predictable location of the birds allow for a more efficient application of control measures (Somers, Vanderhayden, Morris/BROCK).

19. Volatile acidity production during ice wine fermentation is being studied at CCOVI and experiments are underway to discover whether the inoculating yeast is really the source of the VA (Inglis/CCOVI/BROCK)
20. Trials in southwestern Ontario are confirming Niagara Peninsula trials that suggest rootstock is not affecting juice quality parameters (Brix, TA, pH) when averaged over cultivars. They are, however, affecting other yield components, but inconsistently (Zandstra, Fisher/UG)

21. A crop estimating technique was piloted in 6 vinifera cultivars to determine the accuracy of crop prediction at version and proved to be within 3-5%. (Ker/KCMS; Pennechetti/Cave Springs)
22. A large grow tube experiment was repeated again in 1999 and showed that the presence or absence of the grow tube was more critical than the type of grow tube on the growth pattern of the young vines, resulting in longer total growth, greater cane diameter, longer internodes, but fewer shoots. (Ker/KCMS; Huska, Reynolds/CCOVI/BROCK; Pennechetti/Cave Springs).
23. Vine growth is being studied in relation to the impact of weed growth and various control treatments (five weed-free periods and five weedy periods). Vines were assessed for various growth parameters as well as the presence or absence of disease. (Ker/KCMS; Mercier, Reynolds/CCOVI/BROCK; Schenck/Schenk Farms)
24. Mating disruption techniques, started at the emergence of the second generation of berry moth appears to be successful in reducing damage to acceptable levels. (Ker/KCMS; Boyeki/3M)
25. The controversy regarding the role of tissue vs soil analyses for mineral nutrition recommendations in perennial crops, and the timing of the tissue analyses is being addressed with a group of growers and being correlated with field production and fruit quality for that season. (Ker/KCMS; Hunter/Hunter Farms)
26. Work is progressing on the terroir project whereby a large database is being accumulated relating vine size, yield components, fruit components and wine sensory analysis to site, soil type and soil mineralogy. (Reynolds/CCOVI/BROCK)
27. Irrigation and fertigation are being investigated to determine the effect of water stress on Niagaras and the timing of fertigation on Concords on heavy Toledo clay loam. (Reynolds/CCOVI/BROCK; Lepp/Lepp Farms)
28. The reduction of seedlessness through the use of gibberellic acid is being investigated on Sovereign Coronation with fewer hard seeds but more vestigial seeds being the result of various GA applications (Reynolds/CCOVI/BROCK; Tregunno/Tregunno Farms)
29. The effect of veraison treatments of hedging, cluster thinning or leaf pulling and/or the use of aroma enhancing yeasts on Chardonnay musqué will be assessed this spring for flavour components. (Power, Reynolds/CCOVI/BROCK)
30. The effect of six field thinning treatments and three winery yeasts treatments on the development of aromatic compounds of Chardonnay musqué will be assessed this spring. (Sorokowsky, Reynolds/CCOVI/BROCK)
31. Bacterially induced stuck fermentations will be investigated to see whether the addition of diammonium phosphate in combination with various yeasts/bacteria combinations will correct the situation. Further trials will look at the role of lactic and acetic acids in these fermentation conditions (Grant/Reynolds/CCOVI/BROCK).
32. An additional trial, similar to the above, but investigating the role of pyruvic acid and mannitol in these bacterially-induced stuck fermentations. (Schoenfeld, Reynolds/CCOVI/BROCK)
33. Sub-appellation within Niagara, based on distance from the Lake (Lakeshore, Plain, Escarpment Bench) is being investigated with Chardonnay and Riesling. Commercial wines from single vineyards in these three areas are to be described in detail and wines made in

1999 from selected vineyards in these three zones are to be compared to these tasting notes. (Douglas, Reynolds/CCOVI/BROCK; Cliff/AAFC/Summerland)

34. Defining the difference between real and faux icewine has been a challenge and the aroma compounds are to be investigated based on the timing of harvest (late November, mid-December and mid-January), presumably with a greater number of freeze-thaw cycles for each successive harvesting date. (Johnson, Reynolds/CCOVI/BROCK)
35. Rootstock effects on yield components and fruit quality have been inconsistent (14 cultivars and 5 rootstocks), but the data are for only 2 full seasons. Other components, such major and minor nutrient element content at post bloom and veraison and the effect on winter hardiness at three times during the winter (December, January and February) are being observed. (Fisher/UG)
36. An in-row spacing of 1.5 m is giving a more efficient production unit (kg fruit/kg pruning weight), better sugar and TA, but poorer yield per metre of row than 0.85 m. On the other hand, 8 buds/m^2 is resulting in better sugars but less efficiency and yield/m than 12 buds/m^2. (Fisher/UG).
37. Vertico training is resulting in greater yields per metre of row but lower sugars and higher TA. Two-tier flat bow and Scott Henry continue to have the lowest yields and highest sugars. Work has been initiated to investigate the effects of shaded and sun-fleck affected leaves and their contribution to the carbohydrate balance of the whole vine in each training system. (VandenHeuvel, Fisher, Sullivan, Proctor/UG, Reynolds/CCOVI/BROCK)
38. A portion of spent quarry land in Vineland has been levelled, treated with high rates of paper mill biosolids, tiled and had a cover crop planted. It will be planted to vines in spring 2000. Detailed soil analyses have shown no mineral anomalies from the biosolids applications, although cover crop growth was reduced at the heaviest rate. (Fisher/ UG; Bellamy/BellAssoc; Clark, Cassibo/Vineland Quarries; Vail/Vailmont Vineyards)
39. Three experimental vineyards have been planted in Ville Marie (QC), St. Jean (QC) and Alfred to study cultivar adaptability and production techniques in cold climate areas. (Fisher, Caron/UG; Slingerland, Appleby/OMAFRA; Khanizadeh/AAFC; Dessureault/MAPAQ)
40. A high density Concord vineyard (2 m X 2.5 m) was planted in spring 1999 adjacent to an older vineyard interplanted to the same density to compare production efficiency with the use of irrigation. (Fisher/UG; Walters/Walters Custom Works)
41. Several exciting table grape selections have been propagated for second test in HRIO and grower vineyards. Other hardy wine grape selections are being tested at Alfred ON and Ville Marie QC. (Fisher/UG)

B. SERVICE (Tech/Info transfer)

1. Grape IPM research at HRIO/UG - Grape IPM Tour, August 1999 ~ 60 people (McFadden-Smith)
2. Grape IPM research at HRIO/UG - VinCor grower meeting, July 1999 ~ 60 people (McFadden-Smith)
3. Grape Pest Management Workshop, February 1999 ~ 50 people (McFadden-Smith)
4. Grape IPM presentations at joint American and Canadian Phytopathological Societies, Montreal, summer 1999 ~ 400 people. (McFadden-Smith)
5. Grape IPM Winter Workshop ~50 growers (Walker)
6. Grape IPM summer tour ~ 60 growers (Walker)

7. Continued regional delivery of grape IPM programme and Vineland Report with 3000 contacts to Agriphone and 70 weekly Agrifax to growers/dealers (Walker)
8. Website developed under OMAFRA for grape information re: pest management (Walker)
9. Private consulting services provided by KCMS to individual growers, co-operative and wineries in Niagara, Southwestern Ontario and eastern Ontario. These services involve nutrition advice, pest management advice, vineyard development, economic costs of establishment and production and site selection. There is a growing demand for this service.
10. KCMS participated in presentations to Euro Field Day (Harrow) ~ 60 people; OMAFRA Vineyard Establishment workshops February and March ~ 50 people each; OMAFRA IPM Field Day, August ~ 40 people; weekly meeting with OMAFRA and private scouts, June - September;
11. KCMS has 3 papers (with McFadden-Smith; Huska and Reynolds; Waring, Hall McFadden-Smith and Fisher) to present in Australia January 2000 for Fifth International Symposium on Cool Climate Viticulture and Oenology.
12. KCMS has developed a newsletter prototype available by fax or internet to be expanded for 2000
13. Tender Fruit Grapevine technical newsletter published 6 times per year, delivered to 600 grape growers with mailing costs paid for by the Ontario Grape Growers Marketing Board.(Slingerland).
14. Grape Economic Information (1997) originally sent to all grape growers through the OGGMB and over 100 additional copies purchased by oindustry and new growers (Coombe and Slingerland with Fisher, Ker, Walker and Huffman)
15. Vineyard Establishment Course - 2 courses in 1999 with over 100 growers attending and over 100 additional booklets sold to date to interested persons. (Fitts, Slingerland and Walker, with Coome, Fraser, Reynolds, Ker and Fisher)
16. Presentations to potential growers in Prince Edward County ~70 growers (Slingerland and Fisher) and Financial Lenders to the Grape/Wine Industry ~ 20 people (Coombe and Slingerland)
17. Attendance at local grower and government meetings - NPV&VGA (12), Niagara Farm Labour Pool (5), Interministerial Grape and Wine Sector meeting (4), Niagara-on-the-Lake Irrigation Committee (12).
18. Grape Twilight Meeting, August ~60 growers (Slingerland, Fisher and Walker)
19. Grape King Selection Committee for Niagara and Southwestern Ontario (Slingerland and Fisher)
20. Development of information package for novice growers outside traditional commercial grape growing areas (in press) (Slingerland and Fisher)
21. Minor use registrations for vineyard herbicides (12) have been applied for through PMRA (Huffman)

C. INDUSTRY

1. VQA regulations have been legislated and are to be interpreted by a wine authority to uphold the quality and integrity of the Alliance.
2. Direct delivery of wineries to licensees has opened up the restaurant and hotel trade to much more intense marketing on behalf of all VQA members, increasing both their profit and their

visibility.

3. VQA membership requests expanding by 12 for the year 2000.
4. OGGMB has asked for a change in their negotiation mandate to include ice wine juice to regain some order to this part of the market. An expression of opinion vote was conducted by the Farm Products Marketing Commission but results have not been made public yet.

5 Interministerial talks have been renewed for the Grape and Wine Sector Review to co-ordinate strategic plans for the future of this complex segment of the economy. The previous round (1990-1993) resulted in many of the accomplishments of today (VQA legislation, Sunday shopping, direct delivery, planning for the end of the Wine Content Act, National Wine Standards)

6. Minor use registration for 3 miticides for grapes have been applied for through PMRA (Roberts/OGGMB)

GREENHOUSE AND PROTECTED CROPS

A. Greenhouse Vegetables

1. Use of mating disruption for management of the tomato pinworm, and use of pheromones for monitoring of the tomato pinworm.
2. Use of the new biological control agent, *Eretmocerus eremicus*, for management of whiteflies.
3. Use of low cost and environment friendly chloride fertilizers as a standard practice.

B. Mushrooms

1. Growers are using Citation 75WP for control of sciarid flies.
2. We evaluated the effectiveness of zineb as a spawn coating against green mould disease, determined the effectiveness of chlorine and salt as a barrier to green mould infection, compared green mould disease expression using casing inoculum as a spawn and determined the influence of ammonia on germination of green mould spores.
3. We have investigated the ability, timing and expression of other Trichoderma species to spot mushroom tissue.
4. A graduate student has completed the necessary research and is writing thesis on post-crop temperatures and post-harvest management procedures necessary to eradicate a Trichoderma green mould infection.
5. Citation 75WP has been registered through the combined efforts of Engage Agro and ourselves. Further research presently is being conducted on Citation to expand the label for application to the casing.
6. A graduate continues to investigate a unique spotting problem caused by *Pseudomonas tolassii*.
7. Another graduate student is completing his investigation on the cause(s) for the aggressive nature of *Trichoderma harzianum* (biotype Th4) against *Agaricus bisporus* mycelium.

8. A graduate student has begun his studies on the effectiveness of ozone to enhance post-harvest mushroom quality.
9. A research project will commence, once a grad student is located, to investigate the fate of pesticides in recycled water used for mushroom compost preparation.
10. Partial funding has been secured to investigate the possible role of ammonia suppressants on commercial mushroom production.
11. The identification of disease samples continues to provide a significant asset to the industry as they battle the background levels of diseases, especially *Trichoderma* spp.

GREENHOUSE FLORICULTURE

The industry over the past number of years has identified a number of research issues/priorities related to crop production, new crop evaluation and development, crop protection and post harvest handling and shelf-life. The elimination four years ago of the Ornamentals crop protection programme at Vineland Station by Agriculture and Agri-Food Canada (AAFC) continues to be a contentious issue with industry representatives. As was outlined in the 1997 report, the industry has taken the initiative in co-operation with research scientists with the University of Guelph, AAFC and OMAFRA Greenhouse Floriculture Specialists to secure three years of funding for eight specific research projects as identified in the subcommittee priorities. The industry is pleased to see that progress is being made by the research teams now in place and progress being reported by the teams at information organised by industry including Flowers Canada Ontario Research Day in July and the Canadian Greenhouse Conference.

For many years the industry has been frustrated by the lack of pesticide and growth retardant registrations, through the URMULE and URMUR programmes that growers have considered necessary to produce quality crops and to remain competitive with their American and European counterparts. Many of the newer products are more IPM friendly, more effective, less toxic and less harmful to the environment. The industry with matching MII funding has funded a three-year technical position to work under the supervision of OMAFRA Floriculture Specialist and Greenhouse Floriculture Specialists to focus in part on label expansions. As a result, a significant number of URMULE products have been labelled for ornamentals during the two years resulting in a significant reduction in the backlog of pesticides which the industry had identified over the past several years. Unfortunately URMUR registrations have not been successful to date.

Western Flower thrips and their ability to spread the INSV virus continues to cause serious economic losses for growers. Based on recommendations of OMAFRA Floriculture Specialists a number of growers have adopted the use of screening in part of their fan ventilated houses which has reduced the influx of thrips quite successfully. In addition cut rose growers are adopting the removal of all poor quality blooms from the canopy based on research done this year at AAFC Vineland that showed the source of egg laying and larval development occurred primarily in the developing/opening blooms.

LOW ACREAGE & SPECIAL CROPS

1) Pickling Cucumbers: Crop management recommendations to growers on machine-harvesting cucumbers is based on research conducted by Dr. John O'Sullivan at the Simcoe Research Station. In 1999, there was a significant increase in the Ontario cucumber acreage. Tonnage contracted has doubled in the last 2 years. This was due to Multifoods (Bicks) investment of $6 million in a new pickle tank farm near Delhi and increase in the acreage of machine harvested grown, a 2000 acre increase in 1999!

2) Cucumber Beetles: Dr. Jeff Tolman surveyed several field locations for striped cucumber beetle populations and evaluated for resistance against both Guthion and Thiodan (current product registrations). Growers expressed concern that product control measures were often ineffective. Results indicate that there is little or no beetle resistance to either Guthion or Thiodan. It is suggested that growers need to be better informed as to how to control this pest, and therefore better meet their expectations.

3) Cucumber Pollination Study: Dr. Peter Kevan in conjunction with Bick's Pickles surveyed cucumber fields for bee activity. They found that during very hot weather, bees were not able to collect pollen from the male flowers and therefore did not pollinate female flowers adequately. This resulted in a higher-than-normal incidence of culls (nubs and crooks).

4) Garlic: Dr. Lorne Stobbs and Jody Bodnar carried out an extensive survey on 31 garlic farms across Ontario and identified 3 major virus diseases that are potentially affecting yield potential. This work has been written up, and will be submitted to a refereed journal.

5) Pumpkin: Rupp Seeds have taken on the first-ever pumpkin variety selected in Canada. Jody Bodnar encouraged seed companies to consider this very exciting pumpkin for commercial development. Rupp Seeds after 3 years of trials have offered for sale this new variety named Ol' Zebs for the 2000 growing season.

6) Pumpkin & Squash Factsheet: Jody Bodnar and Maribeth Fitts have submitted a pumpkin and squash factsheet for publication. It will be the first time that these crops are profiled by way of an OMAFRA factsheet.

7) Sweet Potato Seminar: Jody Bodnar held a sweet potato seminar last March at the Simcoe Research Station. Approximately 70 growers were in attendance. Sweet potato production increased to about 75 acres during the 1999 growing season, which was up from about 25 acres the year previous.

8) Minor Use Registrations:

Asian Crucifers	Devrinol, Lontrel, for weed control
Asparagus	Nova for rust control
Chinese Broccoli (gai lan)	Lorsban for cabbage maggot control
Leeks	Gesagard for weed control
Lettuce	Admire for aphid control

Snap Beans	Pursuit for weed control
Snow Peas	Pursuit for weed control
Spearmint & Peppermint	Sinbar for weed control
Sugar beets	Pyramin + Nortron (tankmix) for weeds
Sweet Potato, Pumpkin & Squash	Poast for grass control

Minor use registrations are paramount in improving the long-term competitive position of low acreage crops. Close to 40 new minor-use herbicide recommendations have been achieved over the past 2 years!

9) Millet/Sorghum: Mike Columbus in co-operation with Agriculture Environment Renewal Canada and Agriculture & AgriFood Canada held an information field day. Approximately 95 growers were in attendance. Millet and sorghum crop acreage has increased to about 2,500 acres during the 1999 growing season.

MUCK CROPS

1).A downy mildew on lettuce disease forecasting system was implemented as part of the Muck Crops Agriphone/Agrifax/OMAFRA webpage.

2). A minor use registration of Dithane DG for control of onion smut on dry onion bulbs was approved by the PMRA of Health Canada. This registration allows growers to use Dithane DG as a granular in-furrow treatment at seeding time to provide smut control in seeded onions. This treatment is recommended for use where smut has become very severe or if Governor treated seed is being used for onion maggot control.

3). On-going onion smut control research at the Muck Research Station, has shown that Lorsban G insecticide used alone for onion maggot control , has provided reasonably good control of onion smut.

4). At the request of growers, the Muck Crop Newsletter was been brought back into publication in 1999. The 9 issue/year newsletter is a collaborative effort by OMAFRA and U. of Guelph. The MCN features timely production and marketing information for the Ontario Muck Crop growers. U. of Guelph is paying for the cost of printing and mailing.

I. IPM Update:

J. Chaput reported on the status of Muck Crops IPM. In 1999, there were 4 scouts employed by OMAFRA and the Bradford District Pest Management Board who scouted 753 acres of onions, carrots, celery and lettuce for 21 growers.

II. Research Reports:

Dr. M.R. McDonald and graduate students, M. Jaime, C. Hoepting, and C. Kora provided brief

summaries of the following projects:
TITLE: Evaluation of *Allium* products as germination stimulants for control of onion smut, greenhouse trials in 1999
TITLE: Evaluation of Telone C-17 and Telone C-35 for the control of nematodes and pythium root die-back, 1999
TITLE: Evaluation of film coating and furrow fungicide treatments for control of onion smut, 1999
TITLE: Evaluation of split applications of Lorsban 15 G and Lorsban 4 E for control of onion maggot damage, 1999
TITLE: Field evaluation of tebuconazole seed and band applications for the control of onion white rot *(Sclerotium Cepivorum berk)*, 1999
TITLE: Evaluation of fungicide and insecticide treatment combinations for the control of onion smut: field trial in the Holland Marsh, 1999

M. Celetti and T. Clarke provided brief synopsis of " Provincial Cover Crop Trial" species (Sorghum-Sudangrass, Pearl Millet, Marigolds) that inhibit nematodes.

III. URMULE Report /Minor Use Priorities

J. Chaput provided a report on URMULES and Minor Use Priorities
For Allium sp., Carrots, Lettuce, Celery:

Already Underway: Admire, Apron, Dithane, Frontier, Kerb, Lorsban G (for onions), Orthene, Matador (leek), Pirimor (celery), Prowl (green onion, processing carrots, Topas

MUP New Priorities:
- Folicur
- Regent/Cannon
- Agri-mek
- Frontier
- Maxim
- Aztec, Fulfill

NURSERY/LANDSCAPE & TURFGRASS

Research and service efforts continued in 1999, and the following accomplishments are highlighted.

Collection of Marketing and Business Statistics for the Nursery, Landscape, and Turf Sectors of the Horticulture Industry

Ken Nentwig of Ridgetown College is developing and will implement a survey/study of the value-added aspects of the Nursery, Landscape and Turfgrass industry. This should provide much-needed statistical information for industry, researchers, and government agencies, as well as a survey instrument for long-term maintenance of the statistical database.

Background information on related studies from Canada, BC, Ohio and the U.S. have been procured, and the formats and categorization are being compared to what is known and desired for information in Ontario. A number of businesses were interviewed over the summer, in the east and north of Ontario, to gather support and factual information to use in the related study comparisons.

At the same time, scattered bits of (unpublished) information, incomplete to describe the entire range of horticulture business types across Ontario, have been located through Statistics Canada, and availability and access is being checked into at present.

It is anticipated that one or more surveys of businesses in Ontario will be required, to bring updated and pertinent information to light for comparison to the related studies and the StatsCan products. A report on the findings as they stand in early January will be made to Landscape Ontario Congress.

Nutrient Management and Fertilizer Studies of Nursery Stock

A major, cooperative study conducted by Dr. Calvin Chong (HRIO/UofG) and Dr. Glen Lumis (UofG) is examining nutrient recycling via recirculation of water and liquid fertilizers in the production of nursery stock. Commercialization of the process is being pursued, based on the success of the early phases of this study. Industry support and cooperation is a significant component of this work.

Dr. Chong and Dr. Lumis are supervising a graduate student studying the horticultural uses of the residue if the anaerobic digestion waste management system prototype currently under development in the City of Guelph.

Other projects by Dr. Chong and Dr. Lumis are investigating different types of fertilizers and systems of delivery, particularly slow and controlled release products. Production recommendations continue to be made based on medium nutrient loss and plant responses for various nursery crop.
Dr. Chong continued to investigate waste materials (such as jack pine bark compost) that may be used in the container or field production of woody nursery stock. Positive results indicate that there is greater potential for the use of composts and organic wastes in the production of nursery stock. Another ongoing project is examining the use of weed guard systems in container production for nursery crops.

Extension Services for Turf and Woody Plants (OMAFRA)

Pam Charbonneau (turf) and Jennifer Hobson (woody plants) have prepared and conducted numerous sessions for various industry groups throughout 1999. They have participated in and helped coordinate annual industry meetings and conferences. The topics presented have ranged

from IPM programs to a microscopic-disease diagnosis course for turf. Seasonal. hotlines and advisory bulletins continue function effectively and the fee-for-service AgriFAX program for this information continues to be popular. Regular articles have been written for industry and extension publications; and several publications have been revised and priced as part of the technology transfer process. Demonstration trials as well as research trials for salt tolerant roadside turf species have also been conducted. A survey study of European crane fly in Ontario is reported below. Two disease related infosheets, Take-all patch and dollar spot, were posted on the OMAFRA website this summer.

Turfgrass

The turfgrass research program at the Guelph Turfgrass Institute covered a wide range of areas, including performance evaluations of wetting agents for sports turf and golf course uses, irrigation scheduling software, the use of compost as an organic amendment for sand rootzone construction and topdressing, and the disease suppressive potential of compost topdressing material. Some of this work was supported by charging entry fees and on a contract-basis.

There is an ongoing program of evaluation of control methods for turfgrass diseases, including new biocontrol material for snow moulds. Control methods for broadleaf and grass weeds were also evaluated.

Because of the problems with European crane flies in 1998, Pam Charbonneau (OMAFRA) initiated a study to monitor crane fly and leatherjacket activity. This year the damage to lawns and turf from leatherjackets in the spring was not a big problem. Two sites had significant numbers of leatherjackets and were sampled them weekly to track their progress through the season. A new grub has been identified from the Leamington area as the Northern Masked Chafer.

Genetic improvement of turfgrass species using molecular biological and genetic transformation is an ongoing project in the lab of Dr. S. Bowley.

Environmental aspects of turfgrass management were studied through research programs examining the fate of applied nitrogen to turf systems through gaseous losses, plant use, and leaching. Other research in connection with the new putting green installation at the GTI is examining the measurement of soil moisture and irrigation scheduling for optimal water use and conservation. Turfgrass cultivar and variety evaluation trials continue to be conducted by researchers at UofG, GTI, Kemptville and Ridgetown.

Technology transfer occurred back to the sponsor, as well as, the industry in general through reports and the GTI/OTRF Annual Turf Research Field Day, as well as research presentations at the Ontario Turfgrass Symposium. Research reports continue to be offered and expanded via the GTI World-Wide Web Internet site.

POTATO

Management of potato scab using organic amendments (G. Lazarovits. AAFC, London) Organic amendments have proven to be an extremely useful way to manage soil microbiology and fertility. This project will continue examining the formulation and mode of action of these products. The objective is to reduce the amount of organic amendment necessary and to increase the effectiveness of organic amendments in different soils.
In addition, a rapid procedure has been developed to determine the number of parasitic scab bacteria in a soil sample.

- Effect of fertilizers on scab incidence (E. Banks and S. Squire). Although urea reduced the incidence of scab when compared to the other fertilizers tested, the proportion of scabby tubers was still unacceptable. Resistant varieties are the best option to reduce the incidence of scab at this time.

- Monitoring changes in susceptibility of selected populations of Colorado Potato beetles (CPB) to imidacloprid (Admire).(J. Tolman. AAFC, London). No significant changes in susceptibility to Admire were identified in 17 CPB populations from Ontario. In addition, these populations did not show cross resistance between fipronil, a new insecticide not yet registered, and the old cyclodiene insecticides (e.g. aldrin, dieldrin) which share a similar mode of action.

- Evaluation of seed-furrow treatment for control of CPB. (J. Tolman. AAFC, London). Thiamethoxam (Actara), a systemic insecticide related to Admire, provided excellent control of CPB adults and larvae when applied as a seed-furrow treatment.

- Management of wireworms attacking potatoes. (J. Tolman. AAFC, London) Field trials were established near London and Shelburne to investigate the use of insecticides -imidacloprid, fipronil, thiamethoxam and phorate - applied in furrow to control wireworms. A third experiment was established at London investigating the potential of cereal trap rows for management of wireworms. Preliminary results were sufficiently encouraging to continue with this line of research.

- Evaluation of fipronil and Spinosad for CPB control. (E.Banks, OMAFRA)
  These insecticides provided very good control of CPB. Fipronil was effective even under hot weather conditions and also proved effective at controlling the tarnished plant bug.

- Evaluation of Maxim as a seed treatment and Quadris for early blight control
  (E. Banks. OMAFRA.) The effectiveness of Maxim was evaluated at 3 sites: Exeter, Alliston and Grand Bend. Spring weather favored normal crop emergence, and no significant differences were found between Maxim and Easout. Quadris provided excellent control of early blight. This trial was conducted at the Potato Board Research Plot in Alliston.

- Evaluation of new seed treatments to control Rhizoctonia (Robert Hall, U. of G.)

Two new potato seed treatments, Maxim 0.5% and Maxim MZ were compared with the standard product, Easout, for their ability to protect potato plants and tubers from Rhizoctonia. The new products and Easout were equally effective at reducing disease caused by seed - borne Rhizoctonia. Controlling soil-borne Rhizoctonia diseases remains a challenge

- Variety Trials. The Potato Board designated Sam Squire as the Provincial Coordinator for variety testing in the province. He conducted the 1999 variety trials at Alliston, Shelburne and Grand Bend. The trials were funded by the Potato Board. Cultivars from the New York, Michigan and Quebec breeding programs were evaluated. The results of the trials were presented at the Potato Board meeting on December 8, 1999. For the white flesh table market, 7 new lines were selected. Some of these varieties will be grown in commercial fields in 2000.

Sam's expertise on variety testing is invaluable for Ontario potato growers who are now able to see for themselves how these new varieties perform under local conditions.
Advanced lines from the Fredericton breeding program were tested at the Cambridge Research Station by V. Currie. Other lines evaluated at this site included some from the now defunct Guelph breeding program and from the North Central Regional Adaptation Trial.

- Minituber Production. (Becky Hughes. SPUD Unit), New Liskeard) A fertility trial was conducted as part of the spring crop of minitubers from the SPUD Unit. The trial indicated that different varieties need different fertility programs. In addition, a trial was conducted to determine if the growth regulator paclobutrazol could be used to reduce the height of potato stems in greenhouses. All concentrations of paclobutrazol tested reduced plant height by reducing internode length, not the number of leaves. However, minituber yields were also reduced, especially at the higher rate.

- Late blight forecasting system. (R.Hall. U.of G. & E. Banks. Omafra) Due to the dry weather that prevailed during the 1999 growing season, late blight did not develop in the fields where the weather monitoring stations were installed. This project will continue in the year 2000

- Low temperature sweetening of processing potatoes. (R. Yada. Univ. of Guelph) Trials in commercial potato storages were conducted in 1999. This research will continue in the year 2000
- Pearl Millet as a Rotational Crop. (E. Banks & Potato Growers) In 1999, Pearl Millet was grown in 4 commercial fields in the Alliston area. The effect of this grass on potato health will be evaluated this coming season.

SERVICE ACCOMPLISHMENTS

I. The New Liskeard SPUD unit, the tissue-culture center of the Ontario seed potato industry, continues to produce nuclear mini-tubers to supply the seed requirements of 70% to 80% of Ontario seed growers. In 1999, the Spud Unit maintained 35 cultivars *in vitro* and produced approximately 35,000 potato plantlets.

II. The Ontario Potato Update Newsletter was issued 5 times during the 1999 season. Growers received the newsletter by either e-mail, fax or regular mail.

III. The Potato IPM Manual for potato scouts was updated in 1999. It provides useful information on how to identify potato pests and how to monitor fields.

IV. Thirty students attended the Training Sessions for potato scouts. The Sessions were conducted the last week of May at the OMAFRA Orangeville office. Practical training took place in potato fields.

V. The Ontario Seed Potato Growers' Association held its annual meeting on December 11, 1999. This meeting provided seed growers with the latest information on seed-production practices.

VI. The Ontario Seed Potato Growers' Association produced a lithographed booklet, complete with member pictures and vignettes, about their farm operations. This booklet is in many ways unique in the North American seed-potato industry. The booklet was sent to all commercial potato-growers in Ontario.

- A Potato Field Day was held in August in Alliston. The field day included a display of new varieties at the research plots of the Potato Board, field demonstration of a new harvester and display of potato equipment. Dr Ed Plissey from Maine gave a talk on potato bruise reduction. About 100 growers from all over the province attended the field day.

SWEET CORN

1. Cultivar Evaluations. Coordinated fresh market sweet corn cultivar trials were established in 1999 at HRIO, Simcoe, Kemptville College, and Ridgetown College. Funding was acquired from the Safety Net Research and Development Fund, through the OFVGA, as well as from seed companies, which were charged $100.00 per cultivar for a 3 site trial. Seventeen cultivars were included in the trials. Results from sugar-enhanced bicolor fresh market cultivar evaluations from the New Liskeard Agricultural Research Station were also reported. These trials have been run for the past 2 years, and it was proposed to include this site in the coordinated fresh market trial program, with the New Liskeard site evaluating only early cultivars. Fresh market trials were also run at Agriculture Canada, Harrow. Stewarts wilt was prevalent in these trials, and cultivars were ranked for their tolerance to this disease.

Processing sweet corn trials were established at Agriculture Canada, Harrow, Ridgetown College, and Huron Research Station. Southern leaf blight was noted at the Ridgetown and Huron sites.

2. Cultural Management.

Vince Souza-Machado (University of Guelph) evaluated methods of improving the earliness of sweet corn through cultural methods. Treatments included the use of paclobutrazol as a seed treatment to improve plant hardiness of early planted sweet corn, the use of transplanted

sweet corn, and the use of mulches and row covers. They concluded that paclobutrazol seed treatments were not consistent with respect to very early season protection. There were indications that paclobutrazol was effective at higher (less cool) temperatures. Transplants used later in the season may have some potential.

3. Insect and Disease Control. Paul Hagerman reported that he is involved in testing trichogramma wasps for corn borer control on a few farms in Ontario, with mixed results. In Quebec, Francois Fournier of BioControle has considerable experience with trichogramma, where they are widely used by sweet corn growers.

Dr. Ron Pitblado (Ridgetown College) worked with Abbot Labs and Strathroy Foods to test Dipel against European corn borers, with the hope of getting registration. This product is acceptable for organic production, and "friendly" to honeybees. Presently, the cost is twice that of present insecticides.

Success 480 (spinosad) is a "naturolyte" insecticide being developed by Dow, which may be useful for caterpillar control in sweet corn. This product is derived from a bacterium in the soil, and is not considered a biological control. Presently it is acceptable for organic production in the U.S. It has no impact on honeybees, once it has dried on the plant, and is not considered hard on beneficial insects. Registration is expected for other crops this winter, with a chance for expansion to sweet corn soon after.

Matador 120EC (cyholathrin-lambda) is a pyrethroid developed by Zeneca, which is now labeled for sweet corn caterpillars and will be available in 2000. It has several advantages over presently registered pyrethroids, in that it has greater longevity in hot weather, and does not appear to cause aphids flare-ups.

It was reported that rust was a problem in 1999 on certain varieties. Apparently rust is becoming more of a problem in the southern U.S., and the feeling is that there are strains of rust which are able to overcome resistance in the plant.

Stewarts wilt was more prevalent in 1999, and management of this problem was discussed. Predictive models are available, which are based on winter temperatures since the beetle which causes this problem usually cannot survive our winters. These models did not work well in 1998, but did work in 1999. There is also no good correlation between beetle numbers in the field and incidence of stewarts wilt. The beetle has 3 generations in Ontario; if infection occurs by the first generation when the corn is small, up to 40% yield reductions can be expected. However, if infection occurs by the second generation of the beetle, the corn is usually large enough that yield reductions are reduced (up to 10%). Typical symptoms of stewarts wilt include pale striping of the leaves, which should not be confused with nutritional problems. If the plants are cut near the base, browning is noticed in the conductive tissue. Some suggest that bacterial ooze from the vascular tissue is also diagnostic.

Control measures include variety selection, and chemical control. Presently there are no insecticides registered for corn flea beetle control in Ontario, but it was noted that insecticides for corn rootworm and common armyworm control are effective. Apparently the corn is infected via the beetles' frass, which would allow control through systemic insecticides.

4. Weed Control. Todd Cowan (representing Peter Sikkema of Ridgetown) and John O'Sullivan (Simcoe) presented their results on herbicide work for 1999. Many new herbicides

which are used in grain corn are being evaluated for sweet corn. Cultivar sensitivity continues to be apparent for many herbicides. Balance in particular caused a lot of injury in 1999. The Ridgetown program also focused on herbicides for controlling proso millet in sweet corn, which is a major problem for growers in the Huron Park area.

RESEARCH/SERVICE ACCOMPLISHMENTS

1. Internet. The amount of information available to growers via the internet from OMAFRA and other sources continues to increase, and is felt to be an effective method of transfer.

2. Herbicides. Many new herbicides are being evaluated for use in sweet corn, and some new herbicides are available, such as Accent.

3. Vacuum seeders. There is an increased use of vacuum seeders in sweet corn production, especially in conjunction with plastic mulch. These machines provide more precise placement of the seed when compared to conventional seeders

4. Cultivars. Many good quality cultivars continue to be developed and evaluated for the Ontario industry. Seed company involvement in funding cultivar evaluations is increasing.

TENDER FRUIT

- Tender Fruit Grapevine technical newsletter published six times per year and delivered to 600 grape growers and industry. Mailing costs were paid for by the OGGMB. Slingerland
- Plum and Peach Field Day and Open House – Slingerland, Miles, Guarnaccia, Eady, Lay, Walker (60)
- International Dwarf Fruit Tree Association Annual Meeting, Hamilton, Feb, 1999, (500 apple and tender fruit growers)
- CanAdapt peach and nectarine variety trial – project value $399,722 – trees planted at Vineland and Grimsby sites. *Slingerland, OFTA + 2 growers*
- CanAdapt sweet cherry project – data collection and open house (90)Slingerland, Fraser, Cline, NPF&VGA + Growers
- CanAdapt pear project – planted 6 (5 acre) sites testing new rootstocks, selections and training systems. *Slingerland - OMAFRA, OTFPMB, AAFC, Nabisco+ 6 growers*
- Tolerant Fireblight Pear Trial - Evaluating 10 selections and a Central Leader training system. - *Slingerland + 1 grower*
- White fleshed peach grower trials - evaluating new varieties for Ontario conditions. - *Slingerland + 4 growers*
- Sweet and Sour Cherry performance trials – ongoing - *Zandstra*
- Two blue plum cultivars, 'Valerie' and 'Vanette' were named during 1999. Applications have been initiated for Plant Breeders' Rights for both cultivars. Other plums and sweet cherries showing promise propagated through OFTA. *Eady, Lay*
- Fruit Quality Studies to make available quantitative data on the fruit quality at time of

harvest and after storage for our new cultivars and promising selections of cherries and plums compared to standard cultivars. 1999 was the first season of data collection. Preliminary reports have been prepared for limited distribution. A full report will be done following the 2000 season. *Chu*

- - NC-140 Trials - Both the sweet and tart cherry rootstock trials are progressing very well and we expect to see fruiting next season. *Eady, Lay*
- The mini Tatura training system trial with 'Bosc' pears has been harvested but the yield data has not yet been analysed. Prelimary observations indicate that of the 14 combinations under test the most productive is that with trees on 'Qunice A' rootstock with 'Beurre Hardy' interstem. *Eady, Lay*
- Budwood distribution program provides and distributes true to name, virus indexed propagation material of apple, cherry, plum, peach, apricot, and pear to nursery and grower interests. - *HRIO*
- Peach density and N fertilizer rates - 1996 –1999, For three years ammonium nitrate fertilizer rates are determined based on tissue analysis. Three rates were tested: 1) 100%, 2)50% and 3)25% of OMAFRA recommended. No considerable effect on yield or tissue N concentration after three years of decreasing N fertilizer by 50% or 25%. *Derkacz*
- Fertilizer concentration and delivery methods for propagation of nursery peach trees - 1997 – ongoing -. *Derkacz*
- Foliar nutrient supplement (Baby Gold 5, Baby Gold 7, Fantasia) 1998 – ongoing. *Derkazc*
- N availability for high density peach orchard, 1999 – ongoing. *Derkacz*
- Continued breeding program for peach and nectarine. *Miles, Guarnaccia*
- Final year of CanAdapt High Density Peach project, *Miles, Guarnnacia, OTFPMB, Nabisco, Growers*
- Peach Production in Northern climates course for growers Jan 5-7, 2000. *Miles, Guarnnacia, Slingerland*
- Pillar and Upright Peach Tree Form orchard management study initiated. Miles, Guarnnacia
- OREP Project: evaluate the use of natural fruit volatiles to control postharvest brown rot of stone fruit and blue mould of pears - results very promising - will continue if funding is received - *Skog, McGarvey, Murr, industry*
- CanAdapt peach and grape nutrition project: evaluate at harvest and postharvest quality of peaches and nectarines from fertilizer trials - *Derkacz, Skog, Fisher, growers*
- CanAdapt ethylene inhibition and controlled ripening project: improve postharvest quality of peaches, nectarines, pears, apricots and plums through application and evaluation of new ethylene inhibitors - *Skog, Murr, Mueller, Fraser, growers and industry*
- IRAP ozone project: ozone treatment to improve storage of tender fruit - will continue if funding obtained - *Skog, Murr, McDonald*
- OMAFRA- Food Inspection Branch - implemented a changeover of the grade standards from the Ontario processing standards to USDA Standards for Tart Cherries for Manufacture. Collected samples under the Food Safety Monitoring Program. 245

samples of fruits and vegetables were collected in the south-central Ontario district, 63 samples of stone fruit or pears were tested for chemical residue and some additional samples were tested for micro-biological contamination. The number of pesticide residue violations was down in 1999. The Horticultural Section of the Food Inspection Branch is working on developing a horticultural code of practices and also on risk assessments for foods of plant origin.

- Transgenic lines of Bosc pear have been produced in tissue culture and are currently being verified for the presence of a lysozyme gene effective against the fire blight organism – *Hunter*
- Plant Breeder's rights were issued for Harrow Dawn and Harrow Fair peach, Harflame nectarine. Applications for Plant Breeder's Rights are being developed for two pear selections and three apricot cultivars have been named and are ready for commercial introduction. - *Hunter*
- Biological control of Fireblight with microbial antagonists are being investigated - *Svircev*
- First Biological Control with Bacteriophages to prevent the infection of the blossom by the fireblight bacteria is being investigated. – *Svircev, Brock University*
- The use of Systemic Acquired Resistance (SAR) inducers may allow the use of reduced streptomycin and improve the efficiency of biological control agents. *Svircev, University of Toronto*
- The current limitations to application of biotechnology for genetic improvement to peach are the recalcitrance of peach cultivars to tissue culture manipulation, the very low frequency of genetic transformation and availability of defined genetic material carrying traits such as disease resistance, pest resistance and cold-tolerance traits. Research at AAFC has been focussed on the primary limitations; that is, recalcitrance to tissue culture manipulation and genetic transformation. – *Brown*
- *In vitro* techniques for zygotic embryo tissue and methods for *in vitro* shoot multiplication have been established. Two "seasons" of study show that quantities of shoots per culture taken from zygotic embryo tissue of Virgil, Babygold 5, Vulcan, Redhaven and Fantasia (nectarine) vary considerably. *-Brown*
- Genetic transformation of trees by use of an *Agrobacterium* vector containing the gene of interest has been reported in peach, pear, apple and almond. The cultivars Redhaven and Harrow Diamond responded the best in the screening studies. Three nopaline-type strains (A208, C58 and T37) and five octopine strains (A348, TT2, C6S3, A552, and Ach5) were tested.
- Control of Brown Rot on Stone Fruits, ongoing projects – *Zhou*
- Control of Rhizopus Rot on Peaches – *Northover, Zhou*
- Control of blossom and fruit infections, Calcium treatments, Efficacy trials, evaluation of apricot varieties – *McFadden-Smith, Wright*

STATE OF THE INDUSTRY

AGROFORESTRY

Ontario Soil and Crop Improvement Association (OSCIA)
Submitted by **Andrew Graham**, Program Advisor, OSCIA.

1. Environmental Farm Plan – The Ontario Environmental Farm Plan is heading into another winter season of workshops across the province. To date, over 16,000 farm families have participated in the workshops and independent study package (96% and 4% respectively). Over 9,000 of these plans have been voluntarily submitted for peer review. To date, over $7.7 million has been claimed through the EFP Incentive Program. This has spurred environmental expenditures by the farmers towards the same projects totaling more than $23 million. About 65% of those eligible have made a claim. Current federal funding support from Agriculture and Agri-Food Canada's CARD fund delivered by the Agricultural Adaptation Council (AAC) expires in March, 2000. The Ontario Farm Environmental Coalition has prepared a comprehensive proposal that requests funding for another four years. The package will go before AAC for their review in November 1999.

OFEC hopes to have the opportunity to work with OMAFRA in the development of a Third Edition of the EFP workbook. New subjects that will be considered for inclusion involve, among other topics: greenhouse-gas management, water conservation and endangered species and wildlife impacts on agricultural commodities.

2. Restoration of the American chestnut. Farm response to a species at risk – Twenty four demonstration sites have been successfully planted on farms across Ontario to draw attention to the threatened American chestnut tree. The response to this initiative has been overwhelming. Landowners, a variety of government agencies, and many environmental organizations have been extremely interested and supportive. The involvement of the Grand River Conservation Authority in supplying technical guidance and the chestnut seedling stock has been instrumental to the project's success. Local assistance at planting sites has been contributed by Conservation Authorities and Stewardship Councils. Fourteen of the planting sites are within the original 'chestnut belt' in southern Ontario while 10 sites are beyond the original range of the American chestnut. Details of the overall project and each site are being compiled on a dedicated portion of the OSCIA web site: www.ontariosoilcrop.org/AmericanChestnut.htm.

3. Evaluation of Buffer Strip Projects on Ontario Farms – Funding, primarily from the Ontario Ministry of the Environment, has provided OSCIA the opportunity to conduct field evaluations on a selected number of Permanent Cover demonstration projects and bid projects that were planted between 1991 – 1993. The Grand River Conservation Authority is a partner in

the 5-month contract.
One qualified individual has been hired by OSCIA to conduct the field visits. There were 40 farms selected: 20 demonstration sites, and 20 randomly selected bid projects from across the province. Interviews with each landowner were lined up to garner their opinions on how the buffer strip has performed since its establishment. The investigator also performed a biological assessment at each site in an effort to determine the value of the buffer from the standpoint of erosion control, water quality protection, wildlife habitat, etc. The field visits were completed before the end of November 1999. The final report will be completed early in the new-year.

Conservation Authorities and the Forest Gene Conservation Association
Submitted by **Martin Neumann**, Forest Resource Planner, GRCA

1. Seed Certification – On September 21, 1999, the Richard Ivey Foundation approved a grant to the Forest Gene Conservation Association 'to accelerate the development of a certification program for reforestation seed and planting stock in southern Ontario'. The amount of the grant was $100,000, with an additional $50,000 available if the FGCA could obtain matching dollars. Partners of the FGCA in the proposal are the University of Guelph's Centre for Land and Water Stewardship and the Eastern Ontario Model Forest. Conservation Authority staff from across the province were involved in stakeholder sessions which shaped the proposal. Conservation Ontario issued a letter to the FGCA two years ago supporting seed certification. C.A.'s are viewed by the FGCA as a key player in terms of influencing stock buying decisions. The FGCA expects to work closely with seed collectors, nurseries, and C.A.'s to develop the voluntary certification process. Under this process, the origin of seed will always be known at any stage in a seedling's journey. This significant effort over the next two or three years will restore our ability in southern Ontario to make informed decisions regarding the genetic suitability of nursery stock for our planting sites. This capacity was in place for decades until MNR exited the nursery business.

2. Ontario Tree Seed Plant – Like the MNR nurseries, the MNR's Ontario Tree Seed Plant at Angus was until recently in the hands of privatization folks. FGCA and others lobbied successfully for the seed plant to be taken out of their hands and it is now back in the hands of MNR. This is good news because concerns about the availability of appropriate stock are more likely to be addressed if the seed plant maintains some of its traditional function and role. A business plan is currently being prepared for the seed plant.

3. Nursery Stock Procurement – It takes two to five years to bring nursery stock production on-stream, depending on species and size requirements. The last of the MNR nursery stock will be lifted at St. Williams this coming spring. Several years ago when it became evident that the MNR would no longer be growing trees, C.A.'s and Stewardship Councils wrote to the Minister of Natural Resources asking him to ensure the reliable availability of appropriate stock during the transfer of growing capacity to the private sector. Those concerns were well founded and evidently not addressed, as events have subsequently shown. C.A.'s and others are now looking at a very uncertain period for nursery stock procurement between spring of 2000 and 2003 (at least).

The provincial government's failure (Martin's wording) to ensure a smooth transition of growing capacity during privatization has resulted in the present and anticipated procurement difficulties. Reliable availability of such stock should be considered a matter of provincial concern. In the past month some staff assistance has been forthcoming from MNR to help C.A.'s procure stock.

Nut Crop Industry (managed commercial orchards)
Submitted by **Doug Campbell**, SONG member and Private Nursery Operator, N-O-T-L

Production report – The 1999 season was very accommodating for nut crops. We had a good number of frost-free days as well as ample heat units. Most nut crops made good showings and sweet chestnut production took a substantial leap forward. Several growers with still relatively young orchards came on stream with their first commercial crops this fall. Heartnut crops continue to accelerate production with another uniformly good production season. A new performer on the Ontario commercial nut orchard scene is pecan. One orchard of commercial size in Southwestern Ontario has demonstrated that pecan can mature a crop quite satisfactorily with nicely filled kernels. Pecan nut quality is equal to or better than much of the crop which is imported from the United States.

As an estimate, the commercial value of nuts harvested in Ontario was up a good solid 20% or more from the 1998 nut harvest, with approximately 2200 acres in total. Some of the younger bearing chestnut orchards are posting gross incomes of over $2000 per acre (estimated cost of production $900 - $1200 / acre).

OMAFRA Extension
Submitted by **Todd Leuty and Dave Chapeskie, OMAFRA**

1. Pest Management of commercial nut orchards - Insect pest problems are typical of other orchard tree crops and include husk maggot, codling moth on hardy Persian walnut and grafted cultivars of black walnuts. Curculio can cause nut abortion early in the season and can be the cause of substantial crop loss. Curculio and maggot caused a fair bit of damage this season to walnuts of managed orchards.
Sweet chestnut growers are experiencing heavy damage from potato leafhopper and would greatly benefit from Sevin XRL Plus if and when it could be made available to growers. A chestnut weevil has caused very bad crop damage in Ohio and has made itself present in Ontario chestnut orchards as well. Growers in Ohio have achieved good control using Carbaryl in combination with intensive pest monitoring for periods of activity. Sweet chestnut blight is still very active within managed orchards. A numbered chestnut cultivar, a hybrid cross between Chinese chestnut and American chestnut, was thought to be tolerant of chestnut blight was found infected and dead. Chestnut blight was identified by the Guelph pest diagnostic clinic, as the causal agent and was disappointing news.
Bud mite is a problem on hazelnut, damaging blossoms as they open. Growers could do well with some better understanding of bud mite biology in managed hazelnut orchards.

2. Nut Crops (non-horticultural) - It is important to distinguish 'nut production for wildlife in wild settings' from 'commercial nut production for people food in managed orchards'. For example, wild birds are attracted to a wild nut grove while the same wild birds are highly unwelcome in a managed commercial nut orchard (due to effects of pesticide residue and crop consumption). Foresters and Naturalists often refer to nut production as it pertains to wildlife food. Occasionally, Foresters and Horticulturists refer to nut production as people food but is usually limited to hobby collection for personal use and is not considered commercially profitable. Wild nut-producing trees may not be considered profitable in a farming sense, but would be considered valuable to habitat. Wildlife value i.e. in a dollar-equivalent perhaps cannot be determined and is often understood as non-measurable by Naturalists. Wild nuts are gaining in interest for incorporation into wild habitats e.g. OSCIA's sweet chestnut recovery project.

3. Woods-cultivated Ginseng – There are an estimated 1000 – 2000 acres of woods-cultivated ginseng, farmers are often very secretive of their plantings due to concerns of theft. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is currently considering a ban on export of woods-wild ginseng which may affect farmed ginseng since Customs Officials cannot distinguish wild-poached versus woods-cultivated at the borders. OMAFRA is participating with committee activity to encourage support for farmers and supplying markets that exist as legal markets (unlike illegal trades of animal parts).

4. Christmas Tree Farmers of Ontario - Drought has become a concern for Christmas tree producers. The association began testing trickle irrigation to determine the cost / benefit of having the option to precisely water the trees and not the weeds and give them some control over tree quality during dry seasons, especially for the higher valued balsam and Fraser firs. Trials began at 4 farms this past spring. OMAFRA extension was asked to provide initial design assistance for the test on the basis of experience within the orchard and vineyard industries, industries that have previously adopted trickle irrigation technology.

5. Maple Syrup Industry - The 1999 maple crop was highly variable across Ontario both at the regional and individual producer level. Much of this variation was attributable seasonal weather patterns. The crop was normal in the southwestern / south central part of the province with lower yields in eastern and central Ontario. These lower yields were related mainly to poor weather, which resulted in a short sap-run season. Yields ranged from 0.4 to 1.0 litres per tap.
Normal yields in much of southwestern Ontario suggested that the effects of the 1998 drought on production was minimal, possibly masked by a favourable weather pattern or not significant.
The effect of the January 1998 ice storm on production in eastern sugar bushes is not yet known. Preliminary results from applied research designed to answer this question should be available in the year 2000.
Both domestic and international markets for maple syrup were good in 1999 and are projected to grow over the next few years.

University of Guelph, Agroforestry Group
Submitted by **Naresh Thevathasan,** University of Guelph

The year 1999 was more rewarding than 1998 mainly because of additional funding and support received for agroforestry research from various newly evolved stakeholders (see executive summary). This also implies that a niche for agroforestry research is currently being formed among stakeholders, mainly attributed to advances in agroforestry research in southern Ontario. Therefore, the Department has been able to significantly progress in its research, especially research at the tree-crop interface and resource utilization. Furthermore Victoria Road research site, has been selected for Canadian Foundation for Innovation (CFI) program and support and has additionally been listed as a superior demonstration site by the Wellington County Stewardship council. The fact that agroforestry practices were selected for the above program also indicates that these types of land use practices have been identified in southern Ontario as those promoting the stewardship of soil and water resources. The latter development is expected to attract more environmentally concerned stakeholders to agroforestry related land-use management.

The research site has now been established for 13 years and biophysical and ecological interactions at the tree-crop interface are now beginning to become prominent. More funding has been sot from stakeholder groups so that these interactions can be quantitatively measured in the future. The University of Guelph Research Site remains the only site in Canada where tree-crop is replicated in a research design.

APICULTURE & POLLINATION

Biologically, the bees had a great year in 1999. The easy winter of 1998-99 and the early spring combined to bring colonies through into spring in excellent condition. Some queen and nuclei producers had reduced markets, as most beekeepers had to make splits to keep the bees from swarming. The honey crop will equal last year's in quantity across the province with about 130 pounds per hive as the early estimate. Apparently, in many areas of the province, the colour of the honey is more into the golden range due to the hot, dry conditions when the plants were blooming. Colony numbers should reach over 85,000 this year. The number of beekeepers appears to have dropped by about 500 this year and represent the people who have not adopted the recommended IPM program that has been widely disseminated in Ontario. Also there is a group that is trying several alternative methods to control mites without lasting success and another group that will not treat their bees consistently. As can be seen from the rising number of colonies, there are those who have developed a management system that works.

ABYSMAL is the best word to describe the current world bulk price of honey. Prices of about $0.70 per pound Canadian Dollars are being quoted. The prospects are not great for the price to rebound quickly as most packers are covered for their current needs. There was a lot of off shore honey brought into North America last year while beekeepers here were holding for higher prices. There is a large carry over along with the new crop coming onto the market at this time. The price will dampen beekeepers' ambition to increase colony numbers in another season.
Varroa mites have now spread to all areas of Ontario except Thunder Bay, Manitoulin Island, and east of Sault-Ste. Marie around St. Joe's Island. Because of the early season, Varroa also

developed early to the point where they had to be treated in August or the bees would be lost. Beekeepers who were checking their Varroa levels took honey off and treated. Areas where Varroa has just spread to are having the same problems as earlier areas with reinfestation until untreated bees are eliminated.

Nosema disease was showing up at alarming levels, even in the middle of the summer. The feeding method is being examined in order to determine if Fumidil-B is working or if the mites are bringing out the disease more in the bees.

American Foulbrood (AFB) is always rearing its head in different places, and there is a feeling that there is more around the province, but we do not have all the data to determine if it has, in fact changed. Several samples were tested for AFB resistance to Terramycin, and results showed no resistance. There is concern about the development of AFB resistance, since it has developed in the US and BC, so it is recommended that any beekeepers still using grease patties switch to using the dusting method of Tetracycline application. The grease patties are giving too wide of a variation in treatment due to variation in colony strength and amount of the active ingredient in the mix.

Honey Bee Tracheal Mites (HBTM) continue to spread and cover about one third of the bees in Ontario. In new areas such as Grey Bruce this year, they seem to get ahead of everyone and destroy a large number of colonies before beekeepers are aware that they are there. This is in spite of continued admonitions to test for HBTM. Once Formic Acid Pads are administered according to the recommendations, the problem comes under control. **Some beekeepers are not using the right number of small pads for effective control. Application of large pads is resulting in good mite control.**

The OBA and OMAFRA sponsored breeding program is spreading genes for HBTM resistance and also hygienic behaviour to Ontario bees. The grooming behaviour where bees kill Varroa by chewing on them is being added to the program. This is the only breeding program in the world where these characteristics are worked into a beekeeper operated program.

Loss of 847 colonies (1% of total number in Ontario) in the Southwest part of the province was due to Furadan used on sweet corn for earworm control was a major concern in 1999. The Minister of Agriculture has appointed a mediator to bring the parties together to solve this problem.

The spring pollination season came early and fast in 1999. More colonies were moved in response to greater grower demand. Because the season was so short, beekeepers were able to move colonies to summer locations and accomplish more spring management. Summer pollination expanded significantly with the large increase in cucumber acreage. A pollination meeting with beekeepers and growers was held in the spring where an Ontario Honey Bee Pollination Association was formed under the auspices of the Ontario Beekeepers' Association. A survey of colonies rented out for spring and summer pollination was carried out. Results will

be disseminated both to growers and beekeepers.

A world beekeeping congress was held in Vancouver and many Ontario beekeepers attended this excellent world exposition on beekeeping. Many ideas that can be adopted in Ontario were discussed at this world class meeting.

APPLES

The 1999 Ontario apple crop came in well above initial estimates and will probably reach or exceed 16 million bushels, 24% above the 5-year average of 12.2 million. It is also a "vintage" crop of apples, being of excellent quality and taste. The keeping quality of the crop is not known at this time. Heavy rains in some areas in early September as harvest got underway may have a destructive effect later in the storage season. A long harvest period due to the crop size may also have an impact. Impacting on Ontario are bumper crops in adjacent New York and Michigan but a smaller crop on the West Coast.

There is a surplus of juice apples (grounders) with this record crop. At the time of this report in late November there are a good many bins of windfalls still sitting in piles in farmyards waiting to go to the processor. These may or may not move to market, as movement has been very sluggish through November. There are orchards where juice apples will not be harvested. The Ontario Apple Marketing Commission has appealed to the federal government for assistance in reducing stockpiled apples to juice concentrate for future sales.

THE MARKETS

The Ontario Apple Marketing Commission is implementing the recommendations of an Industry Wide Marketing Strategy report prepared by consultants in July 1999. Several of the twelve Strategy recommendations are being acted upon this year including:

- Development of a website to disseminate accurate, reliable and timely market information to growers and packers
- New and larger promotions that raise consumer awareness of Ontario product, customize retail promotions for both domestic and retail markets and gain media attention for Ontario industry programs
- Providing a marketing assistant for hands-on retail work and for more coordination of export promotions
- Revitalizing and upgrading the Orchard Crisp program by exploring a partnership with WWF production protocol and present IPM practices for use as a marketing tool
- Initiating inroads into the Food Service industry in Ontario
- Developing a new cultivars program

Retail representatives were invited to the Commission's annual summer meeting in Georgian Bay this August to participate in field and packinghouse tours enabling them to meet growers and see production firsthand. This was an industry effort to improve rapport with retailers. Thedirect result of this effort is more frequent and better-advertised specials by retailers resulting in more

Ontario apples moving through our domestic markets.

Exports of Ontario apples to the United Kingdom are very brisk at this time as that market continues to demand Ontario-grown Empire.

Last year's dumping of Chinese Apple juice concentrate into North America has been stopped by a U.S. lawsuit. An interim or provisional anti-dump duty of 54.55% has been placed on apple juice concentrate entering the U.S. This should help in buoying up the price for concentrate. A final determination of duty will be made in March 2000.

NURSERY INDUSTRY

In the tree fruit nursery sector, nurserymen are reporting that it is an exciting time with availability of many new cultivars. In many cases, the propagation aspect of the of the nursery business is a challenge since many new cultivars are protected under plant breeders rights and nurseries need to negotiate contracts with owners of plant material.

The 1999 growing year was excellent where sufficient water was available for maintaining nursery trees, especially in southwestern Ontario. A canker or canker-like disease has affected apple trees, particularly in southwestern Ontario. This has affect both nursery stock and bearing trees. At this point it is unclear what the source of the problem is but may be related to SW Injury, fireblight, or collar rot (phytophthora)

While not directly affecting apples, Ontario growers and nurseries have been recently been informed of the Plum Pox Virus (PPV) outbreak on peach trees reported in Pennsylvania October 13, 1999. The strain of the virus has been identified as the 'D' strain. This strain is present in western Europe and is described as being less aggressive than some other strains.

PPV is a serious disease infecting stone fruit species including peaches, nectarines, plums and apricots. It does not affect or is carried by *Malus*. Fruit from infected trees may be blemished (typically with ring spot symptoms) or deformed and frequently drops prematurely from the tree. Although plum pox does not kill trees, it makes fruit unmarketable and drastically reduces yields. Infected trees cannot be treated, only destroyed. The disease is spread over short distances via aphid transmission and over larger distances through the movement of infected budwood or nursery stock. Normal movement of people and equipment from infested orchards is not thought to play a role in the spread of the disease.

U.S. officials have been surveying the area around the original site of the discovery and have found approximately 14 positive orchard sites. The positive sites include peach, plum and nectarine trees and are located within a two mile circle. All positive sites are in the northwestern corner of Adams County in Latimore and Huntington Townships of Pennsylvania.. The Pennsylvania Secretary of Agriculture has placed a quarantine around these two townships prohibiting movement of any *Prunus* plant material. Although the source of the infestation is not known at this time, U.S. officials have determined that some of the trees in affected orchards originated in Washington and New York states.

In response to the virus find in the U.S., the Canadian Food Inspection Agency (CFIA) has

suspended all import permits for *Prunus* plant material (such as scionwood and rootstocks) from Pennsylvania, New York and Washington. Since PPV is not known to occur in Canada and can cause serious economic damage, every effort will be made to prevent the virus from entering and establishing in Canada.

A National Task Force has been put in place to share information with the Canadian Food Inspection Agency (CFIA) and to collaborate on activities to keep Canada free of plum pox virus. The Task Force is comprised of scientists provincial and industry representatives.

BERRY CROPS

The Ontario berry crop industry remains stable. The number of acres of berry crops harvested in Ontario has continued to decline slightly. However, farm gate revenues of approximately $ 23.1 M were reported for strawberries, raspberries and blueberries in 1998 (1998 Agricultural Statistics of Ontario). This is a slight increase over 1997.

As pick-your-own continues to decline in most areas of the province, fresh market sales have increased. Most fruit is sold at the farm gate or through wholesale markets. The processing industry remains small. Around 10% of the reported raspberry and strawberry production in Ontario goes to the processing market.

Most areas across the province experienced a hot, dry summer in 1999. Some areas received adequate rainfall, however other areas had to rely heavily on irrigation. Water availability was a critical issue in some parts of the province. All berry crops were earlier than normal. Prices were average.

Reliable harvest labour is a consistent issue in most berry growing areas. Some of this stems from the shift from PYO to ready picked requiring more labour than in the past. In addition, the season has shifted earlier so that high school students are not available until the latter part of harvest and there is a shift from agricultural summer jobs to the service industry. The lack of reliable harvest help is a major factor in limiting the size of berry plantings in Ontario.

The Ontario Berry Growers Association (OBGA) continued its support of berry crop research in Ontario in 1999. Approximately $20,000 was provided to research programs in strawberry and raspberry breeding and cultivar evaluation, and other selected projects. The OBGA has approximately 250 grower members from all across Ontario representing about 80% of the strawberry and raspberry production in Ontario.

With OMAFRA cutbacks, the OBGA has assumed the costs and management of the Ontario Superior Plant Propagation Program. This program supplies disease-tested plants to the plant propagators. The Plant Propagation Program in Ontario is currently worth $ 3 M per year. The Achene Committee of the OBGA has continued to pursue plant breeders rights agreements on new berry crop cultivars.

Strawberries

There were 4,400 acres of strawberries reported in Ontario in 1999 of which 3,900 were harvested (preliminary figures). This is down slightly from 1998, with 4,465 acres planted and

3,955 harvested (1998 Agricultural Statistics of Ontario).

An early, warm spring in some areas led to strawberry crops two to three weeks earlier than normal while other areas picked at the normal time. This resulted in many areas harvesting at the same time. Yields varied considerably across the province depending on the availability of water. Those areas which received timely rainfall had good to above average yields. In other areas, the yields depended on irrigation. Those that irrigated had good yields while those without irrigation had their worse year ever. The Simcoe area experienced their driest, hottest year on record resulting in strawberry yields only 50-60% of normal. In many areas, the dry fall of 1998 exacerbated plant establishment problems and the crop's ability to withstand the dry conditions of 1999. Some older plantings did not overwinter well.

Due to the hot dry weather disease pressure was less than normal. Misdiagnosed thrip damage was a major problem in strawberries in some parts of the province. Weed control continues to be a problem.

Raspberries

Raspberry acreage has been relatively stable over the past two years, with 1050 and 1110 acres reported harvested in 1999 and 1998, respectively. Raspberries yields varied across the province in 1999. In some areas of the province, those without irrigation suffered complete crop losses while those with irrigation had an average crop. Areas with adequate rainfall reported excellent yields. The demand for raspberries was very good and the price was firm. Fall-bearing raspberries had a good crop but require more marketing to improve demand. Growers continue to convert their plantings to biennial cropping.

In raspberries, the red neck cane borer is becoming a pest. Raspberry crown borer was found in many parts of the province and damage may be significant. Weed control continues to be a problem.

Blueberries

There were reported to be 400 acres and 370 acres of highbush blueberries harvested in 1999 and 1998, respectively. The harvested acres reported for lowbush blueberries were 50 and 65 in 1999 and 1998. The 1999 blueberry crop was average. Two blueberry harvesters are now available for lease in Ontario.

Bird control was a major problem for high-bush blueberries. Netting is probably the best option but it must be cost effective.

Cranberries

The Ontario industry consists primarily of two commercial bogs located near Bala in Muskoka District. New bogs have been established in eastern Ontario, raising Ontario's total acreage to 114 planted acres. There are thousands of acres of bogs and sands in Ontario suitable for cranberry production. The Ontario Cranberry Growers Association represents the existing growers in Ontario.

Current low commodity prices and high start-up costs of $30,000 to 45,000 per acre have limited development in Ontario. A minimum of 20 acres is needed to justify overhead costs and there are no returns for the first two to three years.

CRUCIFER CROPS

General Conditions: As with many growing seasons the weather is a key factor to our successes and challenges. In 1999, the hot, dry conditions across much of southern Ontario led to serious stresses on crops and increased insect activity. Diamondback moth was particularly severe in both Ontario and Quebec. Cabbage maggot damage was very low in most areas. Flea beetles, thrips and tarnished plant bugs were sporadically high in some regions. Diseases were generally low, however wirestem early in the season and scab of radish were noted as serious for short periods. The health of transplants was a serious concern for a number of growers. Infestations of black rot were reported in these transplants, but did not materialize into field epidemics. Asian Crucifer crops continue to suffer from turnip mosaic virus, poor pest control and over use of fertilizers.

Table 1: 1998 Production of Cruciferous Vegetables in Ontario[1]

	Acreage	Farm Value($'000)
broccoli (fresh & proc.)	2,120	4,250
Brussels sprouts (fresh & proc.)	250	455
cabbage, Asian	900	2,000
cabbage, other (fresh & proc.)	3,000	8,750
cauliflower (fresh & proc.)	2,400	8,100
radishes	430	1,100
rutabagas & turnips(fresh & proc.)	1,925	3,880
other Asian-type crucifers	2,000	N/A
TOTAL	13,025	approx. 29,000

[1]OMAFRA.

Broccoli:
In most areas overall quality and yield were average in 1999. Insect pressure was very high for much of the season especially cabbage loopers, cabbageworm and diamondback moth larvae. The reported 'heart maggot' problem was severe for several growers in the York/Durham region.

Cabbage:
Despite the dry conditions, cabbage did relatively well in most areas. Drought stress was noted in all areas, but overall yields were satisfactory. Pest pressures were high as in broccoli.

Cauliflower:
Again as with many cole crops, insect pressures were noted as the most common field problem. Transplant quality was also a concern with high levels of black rot infestation reported in June. Commodity prices were mentioned as generally inconsistent but good overall.

Rutabagas:
Dry growing conditions in the major rutabaga production area was the most significant production problem causing reduced yields and delayed harvest of the early crop. Cabbage maggot, cabbage looper and aphids were reported as the main insect problems. Turnip mosaic virus, transmitted by the aphids, was moderate again this year.

Minor & Specialty Crucifers:
The Ontario **radish** crop was generally good in 1999 with few reported problems. The one major problem remains the soil-borne disease known as scurf caused by *Rhizoctonia.* The hot, dry weather did contribute to excessive top growth on some varieties and misshapen radishes in other cases. A wide range of "specialty" crucifer crops are grown in Ontario and continue to increase in acreage especially in the Holland Marsh area. This includes crops such as **choy sum, yow choy, gai lan, lo bok [daikon], Nappa, pak choy, gai choy and dai gai choy.** Some of these greens are over-produced at peak times causing market prices to crash. As with other crucifer crops in Ontario, the dry, hot weather influenced the main production problems. Flea beetles, cabbage maggot, loopers, clubroot, aphids, downy mildew and bacterial infections are the most common problems. Weed control is still a major concern as is the lack of pest control products for many of these crops. In addition there is poor communication between the majority of these growers and research and extension personnel. Only when serious problems occur in the field or when a fertilizer dealer working with the grower (for eg) needs assistance with a problem are extension personnel called.

Pest Management Programs

Many growers of cole crops monitor their own fields or have a consultant checking the crop regularly. The provincial **cole crop pest alert** was available in 1999. Data was collected from 9 Ontario counties via OMAFRA students, from Quebec and from 4 US states to provide weekly updates on crucifer crop pests. Ten growers and/or agribusiness's subscribed to the faxback service for the alert. In the Exeter, Centralia, Dashwood and Embro areas, 1 OMAFRA student, supervised by the local Hort. Crops Advisor did operate a regional **rutabaga** IPM program involving six commercial growers. 400 acres in ten fields were scouted and the information was made available on the Stratford, OMAFRA Agriphone service.

Quebec
It was reported that conditions were very similar to Ontario in 1999 with some areas receiving more rainfall. Crop management concerns are very much the same in Quebec. A meeting of Ontario and Quebec rutabaga growers, extension agents and researchers in Nov. 99 highlighted the common issues we face. Research at the St. Jean sur Richelieu station covers many different

aspects of crucifer crop production. It was noted that much of this research is partially funded by the Quebec growers and the MII fund and that many of the results are not going to be available to other provinces because the contracts with growers have been written to protect the results in some cases. If Ontario growers would contribute to some of these projects, additional matching funds could be leveraged and results could be obtained and shared concurrently. OMAFRA and MAPAQ have agreed to work more closely together on minor use issues.

GINSENG

The ginseng industry in Ontario is comprised of approximately 4,500 acres of ginseng grown by approximately 250 producers. The 1999 ginseng harvest in Ontario is approximately 4,000,000 lbs. of dried root. There was about 7,000,000 lbs. of dried root harvested in North America in 1999. Demand for North American ginseng is estimated to be about 6,000,000 lbs. annually. Economic growth in China and changes in the use pattern there are expected to lead to increases in demand as high as 20,000,000 lbs. over the next three years.

The main suppliers of ginseng in North America are Ontario, British Columbia and Wisconsin (producing 4,000,000; 1,600,000; and <1,000,000 respectively). Prices for root from different regions varies and this does not appear to reflect root quality. Ontario growers have been offered $10-$27 USD for high quality root and $5-$8 for culls. Growers require about $20.00 USD/lb. to sustain operation.

Approximately 80% of the 1999 crop remains unsold as of Dec 1999 (compared to 10% in 1998). A small number of growers have taken advantage of the Advance Payment Program.

The 1999 harvested roots are generally smaller in size and consist of more 4 year old roots and consequently more disease is present. Four-year old root runs at about 35% culls due to a root rot suspected to be caused by the soil fungus, Cylindrocarpon.

Industry suppliers are expressing concern about the availability of farm dollars to purchase necessary supplied for production. Lending institutions have expressed nervousness at the low prices offered to growers this season.

GRAPE AND WINE

A. THE 1999 SEASON

The Niagara Peninsula

The 1999 season was warmer and drier than normal. The winter minimum for 1998-99 was only -15.1 C for the evening of January 10-11. January also saw heavy snowfalls (128 mm equivalent, double the 80-year average at Vineland), replenishing much needed groundwater since both 1998

and 1997 had been very dry. Although April was normal, the balance of the spring was warm and still dry, bringing bloom on about 10-12 days ahead of normal. June was generally dry and July was very hot, with the highest heat units for the month recorded (Table 1). Rain was uneven throughout the Peninsula and July rains were critical as August became very dry. Two localized hail storms in August damaged some fruit but few grapes. September and October rain was 50-60% higher than normal, again replenishing much needed groundwater and putting grapes in a better overwintering condition..

Grape vines came through the winter in excellent condition and one of the largest wine grape crops since the pull-out programme was predicted due to new plantings coming into bearing and the lack of winter injury in the established plantings. Grape planting was very active this spring but was delayed in June because of excessively dry soil conditions. Established wine grapes thrived in the Mediterranean heat of July and August, but newly planted vineyards required watering and/or irrigation. More irrigation was seen in vineyards than ever before. Most of this was concentrated in Niagara Township, where peach growers have had the equipment and water available for some time. With this increased demand, a comprehensive irrigation plan is being developed for the township with the aid of the St. Lawrence Seaway Authority who control the supplementary water for the irrigation.

The heat and drought brought on early varieties together in late August and early September, but the rains in September and October delayed the later varieties, making the harvest season a very long one. Tonnage of these late varieties, particularly Vidal, was under estimated because of the effect of these late rains. The only varieties showing stress during the season were Concords and Niagaras on the poorer soils, where the August drought brought on potassium deficiency and some defoliation. Many of these are tired old vineyards on the top of the escarpment where supplementary water if not available. There are fewer of these to worry about each season.

The hot dry season resulted in very low pressure for the diseases normally associated with moisture - downy mildew, phomopsis cane and leaf blight, black rot and botrytis bunch rot. However, powdery mildew thrived in the heat and humidity. There was some question as to the effectiveness of the standard mildew control materials, but resistance has not been proven yet. The hot weather and rains of early September resulted in considerable breakdown of tight bunched or early varieties - Pinot gris, Pinot noir, Gamay noir, some Chardonnay and some Riesling.

Table 1: Heat Unit Accumulation and Precipitation for three sites in the Niagara Agricultural Weather Network

	Degree day accumulation above 10° C								Rainfall			
Queens-	1999		1998		1997		1996		1999	1998	1997	1996
ton	Act[a]	Cum[b]	Act	Cum	Act	Cum	Act	Cum	mm	mm	mm	mm
April	42	42	51	51	38	38	31	31	63	64	38	**139**
May	202	244	233	284	70	108	126	157	63	**0**	46	**137**
June	**358**	602	294	578	315	423	288	445	**0**	18	106	**108**
July	**450**	1052	372	950	359	782	332	777	55	119	33	15
August	314	1366	384	1334	305	1087	363	1140	85	19	71	50
September	261	1627	268	1602	170	1257	212	1352	111	23	114	**198**
October	80	**1707**	103	**1705**	95	**1352**	72	**1428**	92	42	59	98
Lakeshore												
April	25	25	32	32	25	25	21	21	63	62	32	**128**
May	139	164	188	220	47	72	87	108	61	53	59	**129**
June	**322**	486	274	494	286	358	251	359	26	53	112	**121**
July	**419**	915	372	866	339	697	319	678	62	72	41	27
August	306	1221	369	1235	295	992	356	1034	55	**14**	82	**3**
September	253	1474	260	1495	164	1156	200	1234	**121**	26	104	98
October	70	**1544**	96	**1591**	82	**1238**	65	**1299**	88	55	57	73
Grimsby												
April	29	29	35	35	27	27	22	22	64	60	29	**148**
May	138	167	186	221	44	71	90	112	66	53	58	81
June	296	463	264	485	277	348	240	352	31	52	53	**117**
July	**415**	878	336	821	315	663	298	650	90	82	45	**118**
August	284	1162	341	1162	268	931	334	984	55	30	43	65
September	222	1384	233	1365	137	1068	174	1158	91	40	52	**169**
October	59	**1443**	75	**1470**	71	**1139**	52	**1210**	80	27	42	94

[a] Act. = Actual values [(Daily Max + Daily Min)/2]-10 summed for the month [b]Cum. = Cumulated monthly values.

Grape berry moth (GBM) activity was early in 1999, coinciding with a high degree day accumulation for may and June. Both conventional pesticides and mating disruption technology worked well as insect pressure was generally low. Only a few sites reported high grape leafhopper populations and Guthion appeared to be still effective. Potato leafhopper was not a problem in 1999 and needed no special programme. European red mite (ERM) pressure was lower in 1999 than 1998, perhaps due to late summer programmes in 1998, poor overwintering conditions and the very high daytime temperatures along with high humidity, particularly in July and early August. Leaf phylloxera was not a serious problem, except in highly localized French hybrids or hybrids derived populations.

In spite of the challenges of the 1999 season, growers provided wineries and juice manufacturers with some of the highest quality fruit in many years

Essex/Kent/Southwestern Ontario

Winter injury was also minimal in Essex, but where growers had weather loggers in their vineyards, temperatures were reported as low as -22 to -20 °C in mid winter and -16 to -18 °C in mid March, demonstrating again that Essex/Kent winters fluctuate more than those of Niagara and growers have to be more vigilant regarding winter injury. The southwest was also very warm and dry and challenged growers in terms of water management. Soils were very dry in May and June. Newly planted vineyards had to be irrigated to keep them alive and established growers are looking seriously into permanent irrigation equipment. The Cedar Springs area of Kent County reported only 5mm of rain in August whereas the normal is closer to 95mm. But, as with Niagara, later rains boosted the crop and yields of well established vineyards were up 20% over estimates.

Disease pressure was low in 1999 but botrytis bunch rot appears to be a chronic problem with Pinot gris. GBM catches have been increasing in the past few years, perhaps indicating a larger resident population with the increase in vineyards. Bird pressure is becoming sever in several vineyards, particularly with early cultivars.

Prince Edward County and eastern Ontario

The season in the east was generally reflective of the rest of the province, being warmer than normal. However, The County received adequate rainfall throughout the season, and did not suffer the summer drought of the more westerly regions. Some winter injury was observed in grapes in The County, but the damage was probably aggravated by inappropriate management techniques and not due to absolute cold.

Early season diseases do not appear to be a problem at the moment in The County, but powdery mildew was quite evident in new plantings this summer, probably due to inappropriate spray programmes. Growers are still learning about disease and insect management here. Rodent

damage (voles) has been a problem in vineyards with very low trellises and weedy undergrowth.

B. THE CROP

i) Wine grapes

The 1999 season was an excellent one. The season started early but differed from 1998 in that moisture was 20-40% greater by the end of the growing season, depending on location. More growers with access to Lake Ontario put in irrigation systems. Sugar readings were higher than average for both wine and juice varieties, similar to 1998. Although prices were lower per tonne for 1999, volume increased. Preliminary reports suggest that the 1999 crop was 25-30% higher than 1998, mainly due to increased production from new plantings.

ii) Table grapes

The fresh grape crop was up 11% from 1998. The variety Sovereign Coronation was up sharply. 200% but Fredonia was well below normal due to hail and poor set. Other blue varieties were essentially static. Returns for Sovereign Coronation were down due to an increase in container prices and a later portion of the crop being sold at the regular Fredonia/Patricia prices when the two varieties began to overlap at the dealers. Again in 1999, Sovereign Coronation was not totally seedless.

iii) Juice grapes

The season was early, as with all other varieties. Concords were up about 25% and Niagaras about 20%, but only in certain areas that received the late rains in September. Brix averages for both Welch and Mott's North America were well above average. Concord was 17 °B for both companies and Niagaras 15.5 °B for Mott's and 14.1 °B for Welch. Exports to Welch are increasing (1999 = 1740 tons of Niagaras and 3200 tons of Concords) and sales to Cliffstar (also in New York) are also climbing. Mott's purchases were also higher in 1999. Yields are increasing due to newer plantings (mainly Niagaras) and better husbandry. Welch calculated their yields to be 4.6 tons/acre for Niagaras and 3.3 tons/acre for Concords. These are still below their eastern pool averages, but many of the poorer vineyards that are not competitive are being abandoned or removed.

C THE INDUSTRY

i) Wine grape growing

In Niagara, land prices continue to be driven up by the expansion of the grape industry. Interest is still high among new growers with aspirations of new wineries, established growers are reducing new plantings in order to concentrate on recovering their investments of the past 4-5 years. Agri-tourism is still at a feverish pitch, also driven by the grape/winery activity. Most wineries are bustling with tourists on the weekends throughout the year and every day of the week during the summer. Expansion of existing wineries and the application for licence, building and opening of new wineries continues to strengthen the grape and wine industry.

This activity is not restricted to the Niagara Peninsula and expansion and new winery ventures

are underway in Essex County, Prince Edward County, Simcoe County and

Durham/Northumberland counties. To reflect this, the annual Grape King Competition, sponsored by the Ontario Grape Growers' Marketing Board was opened up to growers outside the Niagara Peninsula in 1998, and in 1999 the new king was Sal D'Angelo of Amherstburg in Essex County who was crowned in his own vineyard.

In Prince Edward Country and eastern Ontario, several adventurous growers have been experimenting with wine grapes in The County. In the past 2 years, interest has increased considerably, as well as the publicity and the curiosity of the wine writers. An experimental plot of French hybrids, planted in Waupoos in 1992-93, has now expanded to 4 hectares and now includes vinifera cultivars. Another test plot, planted in 1995 in Hillier, contains mainly Pinot noir and has now expanded to about 2 hectares. In 1998, another hectare was planted in Rossmore, on the north side of the peninsula. This plot was mixed French hybrids and vinifera. In 1999, three more plots were planted in the Wellington, Hillier and Milford area. There are plans others growers and a doubling of the existing acreage (now ~ 10 ha) in the spring of 2000.

Soil maps of The County are out of print and not readily available for the growers to make good choices of land. Thermal mapping of the County would be an invaluable tool, in combination with soil maps, to guide growers and potential investors into making good site selection. The obvious, most serious limitation in The County is the winter. Minima regularly reach -22 to -25 °C, critical temperatures for all classes of wine grapes. Sites for planting will have to be monitored carefully for frequency of these temperatures. With the introduction of cheap, versatile, and user friendly temperature monitoring equipment (~$300/unit with 4 channels), growers are in the process of installing temperature loggers at their sites.

These growers are also choosing their varieties very carefully because they must be adapted to a short growing season and become acclimated for winter as well. Ice wine is being talked about, but not completed as yet. Most growers are looking at this expansion as a long slow project and are prepared to wait for a return on their investment.

All growers are concerned about the inequities of Canada/USA pesticide registration and the impending review of many key organophosphates. This, coupled with manufacturers imposed limitations (EBDC fungicides pre-bloom only) has made the pesticide issue with grapes quite complex. Replacement materials are slow to arrive on the market, even when the issue is a label expansion, not a new registration. One of the big issues here is the integration of these new material with the old ones and how a new pest management strategy should be developed.

ii) Table grape growing

Although there has been an expansion in the variety Sovereign Coronation, most vineyards producing table grapes are old and inefficient. They are also labrusca varieties that normally require little care and attention. The vineyards require a minimal spray programme. The pruning

and trellising is not complicated and the land is usually untiled and heavy clay or clay loam. These vineyard are perhaps an appropriate use for the land in the state that it is, but are not a progressive part of the grape and wine industry. For this reason, the cultivars have not changed (Van Buren, Fredonia, Patricia and a few Concords) and the sales have been quite static.

If this part of the industry is to become even locally competitive, growers must begin to put the amount of labour into an acre of grapes equivalent to that in the wine industry. This will require better land preparation, more intensive plantings, better trellising, better spray programmes, multiple picking like other fresh fruit and, above all, better varieties. This will require a whole different mindset on the part of table grape growers and we aren't there yet.

iii) Juice grape growing

Although low yields have been the bane the juice industry, the past season showed good gains in tonnes/acres for well managed vineyards. However, the issue of pesticide usage is a difficult one because of regulations imposed by the manufacturer that leave little substitution available for a downy mildew outbreak after bloom. Two dry seasons have been kind to the growers, but new materials are needed for this particular period of the season. Many of these alternative materials are already registered in the US.

Also, the impending review of the organophosphates by the FPQA/EPA in the US may put the use of some common insecticides for berry moth and leafhopper control in doubt. Because the crop is being processed in the United States or in Canada for the US market, it is subject to US residue tolerances. The manufacturers are willing to assist with the testing necessary to expedite these registrations.

The juice industry is quite buoyant at the moment, increasing due to the positive reports regarding health benefits of their products. there is a potential for another good crop in 2000 because of the favourable conditions during bloom in 1999. Niagaras are still in short supply and the National Grape Co-operative is still be offering a $750 US per acre incentive to plant new vineyards in 2000 and 2001. This could help in the re-planting of some old Concord vineyards that are unproductive and non-competitive.

iv) Wine production

In May, the industry predicted a surplus of about 10,000 tonnes of wine grapes and price negotiations in July resulted in a 12% decrease overall. Due to the price drop, winery purchases of local wine grapes increased, meaning that less imported wine would be used in blending. For the first time, there were contracted and non-contracted grapes being sold, the non-contracted ones bringing $65/tonne less (Class 7, white French hybrids). this created some confusion in the marketplace.

Because of the impending surplus, US and other markets were actively pursued. Canandaigua Wines accepted considerable tonnage of white French hybrids and Vineco International Products

Ltd. undertook a pilot project to concentrate juice for the home wine making market. These products will be evaluated for quality and price competitiveness. New markets will have to be found for varieties such as the white French hybrids since sales of bulk blended wines in Ontario are declining. Also, Vidal, normally left for ice wine production, was available for the table wine market as sales of icewine were slow. Wineries are encouraging the removal of some of these white French hybrids and re-planting with red vinifera varieties, but this will not be possible for growers in less favourable sites.

The Ontario Grape Growers' Marketing Board (OGGMB) has requested an amendment in its regulations to allow for the negotiation of late harvest and ice wine juice under its authority. An expression of opinion vote was conducted by the Farm Products Marketing Commission, but results have not been published. A positive vote will mean that the OGGMB will be able to negotiate minimum prices for late harvest and ice wine juice on behalf of its members.

The Wine Content Act (WCA) sunsets on December 31, 2000. It currently allows for the blending of up to 70% imported wine in a bottle marked 'Product of Ontario'. The OGGMB, as does the Wine Council of Ontario (WCO), feels that the National Wines Standards should replace the WCA. This would mean the wine labelled as 'Product of Ontario' would have to have a minimum of 75% Canadian product in it and there is a concern that the local industry could supply enough fruit of the appropriate quality in 2001 for the present level of sales.

The only wine label that guarantees total Canadian content is one with the presence of a VQA designation. With the adoption of the National Wine Standards, products presently labelled 'Product of Canada' will have to be re-labelled as 'Cellared in Canada' and stating the Canadian winery and the country of origin of the blending wines. Labelling is a federal government issue and as such, very difficult to enforce compliance at the moment. A new round of National Wine Standards talks will resume in the new year in Aylmer, Quebec and hopes are high that an agreement will be reached among all provinces. This will allow for federal standardizing of wine labelling and will create a federal level of wine authority for foreign wine trade negotiations.

The VQA has secured an official mark status for Icewine, This type of trademark protection will allow the VQA to require any manufacturer of ice wine to meet the standards for ice wine production as set out by the VQA. Products not meeting those standards or manufacturers choosing not to comply must find another term to describe their product.

VQA Canada was established in 1998 to create an umbrella organization to bring other provinces into agreement with the various regulations within VQA. As a result national VQA standards were developed, under which other provinces could seek derogation, particularly in terms of varieties, but still comply with the minimum production standards as originally developed in Ontario. This has already occurred with British Columbia where similar varieties are being grown and similar wines being produced. However, Quebec and Nova Scotia, with their more severe climate, require different varieties and perhaps different production methods, without compromising the integrity of the VQA itself.

One of the highlights of 1999 for the VQA was the passing of enabling legislation that will give the VQA the legal grounds to protect and maintain its standards. This legislation missed final reading in the 1998/99 session but was passed with little difficulty in the fall session of 1999. The legal makeup and terms of reference of the Wine Authority, the body actually interpreting and enforcing the VQA regulations in concert with the LCBO, is still being addressed.

Another major coup for the VQA was the passing of direct delivery privileges for VQA members. This allows VQA member s to deliver directly to licensees, circumventing the LCBO flat tax of $1.50 as well as the regular LCBO mark-up. This will double the profit to the VQA members and will give an opportunity for wineries to become a major influence on restaurant wine lists through direct contact. This has been very successful in British Columbia where local wines have a much higher profile in the BC restaurants and hotels. Already, there have been over a dozen new applications for VQA membership from small houses that were debating whether the fees and regulations imposed were necessary for success in the Ontario industry.

On the other hand, the Ontario wine market share has been dropping, as Canada is being targeted again, particularly by Australia and South America as an untapped market for increasing wine sales. The LCBO have entered into a marketing strategy with the Wine Council of Ontario and the VQA to try and get this share back into positive increments and breach the 50% mark within the year 2000. In addition, the Wine Council of Ontario, Ontario Ministry of Agriculture, Food and Rural Affairs, the Ministry of Consumer and Commercial Relations, the Ministry of Economic Development and trade, the Liquor Control Board of Ontario and the Ontario Grape Growers Marketing Board have entered into strategic planning talks, similar to those initiated 7-8 years ago. Many of the successes of the present are due to the cooperation of all of these parties and agreements as to their individual roles in the future of the industry. It is time to revisit this exercise.

v) Juice production

The continued uncertainty regarding the future of the Mott's plant in St. Catharines remains to dog the juice industry. Many growers are still reluctant to sign long term agreements with an American co-operative or with American companies requiring fruit to be trucked into the United States because there are no Canadian crushing facilities. The psychology of a border crossing and the nagging possibility of non-tariff barriers being imposed without warning make the growers feel very vulnerable, particularly when all the present buyers of labrusca grapes for juice are American and two of the three have no Canadian base.

The American manufacturers are also concerned about the discrepancy between US and Canadian registrations for pesticides and voiced concern regarding the impact of the EPA/FQPA reviews in the near future. They expressed a desire to assist in any way possible in the lobbying for speedier labelling and label extensions.

D: THE NIAGARA AREA WEATHER NETWORK (NAWN)

The consortium to administer NAWN was formalized in the summer of 1999 and is made up of OMAFRA, OGGMB, OTFPMB, AAFC/Vineland, CCOVI/Brock, UG/Plant Agriculture and the WCO . A motion was passed to move the equipment from the OGGMB offices to Brock University. Sandra Yee was contracted to oversee the data management. During the season, one station (Niagara River Parkway) was hit by lightening and later had the solar panel stolen. The only serious down-time for the whole system was during the move to Brock in November of 1999. A new station is to be commissioned at Niagara College on their Glendale campus. The tower and instruments are to be located in the centre of their new teaching vineyard, but, as of this writing, has not yet been installed.

Regular maintenance and keeping the system in working order has been the priority. Maintenance of the field equipment (dirt in the rain gauges, spurious readings, stolen/damaged equipment, telephone line failures) is always a problem when no one person is dedicated to the system,. Some system modifications are required to develop a method of tracing problems. Y2K compliance has been tested. Customer requests and inquiries are being answered by Sandra Yee.

A very nice media opportunity arose in mid-summer when the Minister of Agriculture was in the area to announce the successful Rural Job Strategy grant that would expand NAWN by 3 more stations. There was coverage in several local newspapers and the TV news for Hamilton. promotion has also been extended through the CCOVI at Brock and their affiliate Okanagan College in BC. A web site has also been developed, with access for members that may evolve into the primary distribution system. More publicity is required to make the system and its data attractive to other, perhaps future partners, such as the Niagara Region, Soil and Crop Improvement Association, AES and their former local forecasters or Niagara College.

Data generated by NAWN will be incorporated into programmes such as Bugwatch and other predictive models for powdery and downy mildew that can eventually be used to develop more environmentally responsive pest management programmes. However, upgraded computer equipment is probably required before these programmes can move forward. The possibilities for disease, pest and maturity modelling are quite exciting if access to raw data is available to research personnel. However, several ongoing programmes are stymied by lack of direct access to raw data files.

The new OMAFRA organization chart doesn't appear to have a support member for the present OMAFRA weather stations of which Vineland was one. Vineland was originally to be integrated into the NAWN system, but that seems not to have happened. It represents a link to 90 years of weather data and could prove invaluable in testing model systems.

GREENHOUSE AND PROTECTED CROPS

A. Greenhouse Vegetables

General comments:

The 1999 season started off with cloudy weather in January and February; the subsequent months were clear, warm and dry. This resulted in a season with a slightly delayed harvest and a strong finish. The favorable light and temperature conditions allowed for high productivity late in the season.

The Ontario greenhouse vegetable industry expanded by another 52 hectares (129 acres) in 1999. The majority of the construction occurred in the Leamington area. Most of the new construction consisted of double poly, gutter vented greenhouses. There was approximately 6 acres of glass covered houses constructed.

The trend towards the use of hot water heating systems continues as more growers prefer it. This, with carts, will assist in improving labor efficiency. Labor continues to be an issue and changes to improve working conditions and efficiencies continues.

The practice of high wire cropping is becoming popular as more growers use carts to work the taller crop. Summer CO_2 supplementation has resulted in improved productivity. Liquid CO_2 continues to be economical. The use of hot water systems has allowed more growers practice flue gas CO_2 supplementation.

The US continues to be the main customer accounting for approximately 65% of the market. The challenge to maintain these markets with an increasing acreage developing in the Southern US is being met by the Ontario industry through in-store demonstrations, greater service and improved quality.

Tomato Production

The early tomato crop (sown October-November) was raised under excellent light conditions. The plants were strong, with good well-developed root systems and flowers and excellent fruit on the first 2-3 clusters. The later planting (sown November-December) was raised under low light conditions resulting in weak plants and poor first 1-2 clusters. Fruit quality (misshapen fruit) was degraded on the 4-5th clusters of early plantings, and on the 1-2nd clusters on late plantings. Harvest was delayed by 2 weeks, but the higher light intensity and temperature during the summer months improved production. However, this also resulted in poor fruit quality (russeting, green shoulders, blotchy ripening, and blossom-end-rot.).

Fall plantings were difficult to establish due to the high temperature. However, once plant were established, fruit setting and subsequent plant growth was successful. Poor pollination on the 4-5th clusters was attributed to poor pollen development due to high temperatures. This resulted in sets with only 1-2 tomatoes.

Trust generally did not perform very well during the hot summer and produced poor quality fruits at that time. Growers are therefore looking to other cultivars such as Rhapsody and Quest for better quality during 2000.

Cluster tomatoes have been a viable component of the tomato industry; currently, there are approximately 61 acres of cluster tomatoes in Ontario. The size, shape and color of tomatoes continue to change, as new markets are developed.

Some growers have expressed interest in new production methods, such as hanging gutters, and some are even ready for large scale experimentation with such systems.

Tomato prices started off quite well, but dropped below average in May-June and remained there until the end of the crop. Overall, there was approximately 10% decrease in price. However, this was offset somewhat by the fact that the production was 10% higher.

Tomato Pests & Diseases

At least over 85 ha of tomatoes were affected by the tomato pinworm. This pest was generally suppressed with a combination of mating disruption, light traps, and removal of infested leaves. Although the greenhouse whitefly was problematic at times, growers were generally able to control this pest with biological control agents. Towards late spring and during summer, leaf miners were observed in many operations and caused relatively severe damage in some crops. During summer, cabbage loopers became a prevalent pest, and its presence in some crops persisted throughout into early fall. Other pests during summer included the tomato russet mite, western flower thrips, and fruit-worms (*Heliothis* spp.)

Disease problems during this year included bacterial canker, which was observed starting from early spring in several operations. This disease became more widespread as summer approached. Implementation of very stringent sanitation practices prevented severe losses. Botrytis was a widespread problem in the fall. Powdery mildew appeared early on in many crops, but a combination of fungicides and pro-active greenhouse environment control kept this disease under control. Some operations suffered some plant losses due to wilting caused by a combination of Pythium root rot and Corky root rot. There was an isolated incidence of late blight in one fall crop caused mainly by poor environment control.

Cucumber Production

Early cucumber plantings underwent similar trends as those of tomatoes in that they were established under good growing conditions (light) and were quite early to harvest. Later plantings were slower in growth and to harvest. Fruit quality was good to excellent in early cucumber crops. Normal cucumber plantings (sown in December) were delayed slightly due to poor light conditions during January and February and subsequently did not handle the intense light and high temperature conditions too well.

Fall plantings established well, and fruit quality and yield were good. Production was generally good and prices were overall reasonable. Prices started at normal seasonal levels, dipped for 2-3 weeks and then remained at average for the rest of the season. This resulted in an overall average financial year.

Cucumber cultivar selection remains a problem as newly released cultivars show some improvement in fruit quality and plant performance, but do not really stand out. The use of PMT cultivars continues as more growers choose biological control strategies for pest management.

There is a group of growers developing a mini-cuke and gherkin market on a small scale.

It was noted that there is potential for marketing of sizes that are smaller than the standard size in the US. There will be investigation into this potential by the Marketing Board.

There is generally an increase in the number of crops per year from two to three, either as a result of planning, or of necessity due to the state and vigour of the crop.

Larger operations are moving towards staggering planting dates to even out production and reduce pressure on the market early on.

Cucumber Pests & Diseases

During winter and early spring, there were low levels of the greenhouse whitefly and western flower thrips. The Beet Pseudo Yellows Virus, which is vectored by the greenhouse whitefly, was observed in most greenhouses by late spring. The incidence of this disease increased as the weather warmed up and populations of the whitefly increased. Whiteflies were present in virtually all fall crops. The two-spotted spider mites appeared during mid to late winter and persisted until late summer and early fall. During late spring, Lygus bugs and cucumber beetles attacked crops, particularly those using biological controls. The beetles caused some plant loss by infecting plants with the bacteria, *Erwinia* sp. that causes bacterial wilt. During summer, cabbage loopers was an additional persistent pest.

The major diseases this year were Pythium root rot and powdery mildew. Pythium root rot was particularly serious in some fall crops when hot, stressful, weather favoured infections by this fungus. Powdery mildew was quite widespread with its incidence being somewhat lessened in operations where powdery mildew tolerant varieties were used. There are reports of decreased efficacy of Nova and a need for alternative products for powdery mildew control. Early in the year, Penicillium stem rot was present in several operations and persisted at low levels during the spring crop. Gummy stem blight and Botrytis infected most crops but losses due to these diseases remained relatively low. There was one unusual incidence of Phomopsis stem rot in a fall crop.

Pepper Production

Balanced pepper transplants established rapidly in the 1999 growing season. Good balancing of fruit load with leaf area (with fruit pruning) resulted in good fruit quality during the early part of the season, despite the poor light conditions. The improved light and temperature later on resulted in more good growth and fruit quality. Extra leaves left on the plant late in the season improved fruit quality dramatically, minimizing sun scald and BER fruit quality problems. The high light and temperature conditions in the summer was a problem in some operations (poor fruit quality) and measures to correct this included proper water management, whitewashing of the greenhouse and improved plant balancing with such cultural practices as leaf and fruit pruning.

The most commonly grown pepper cultivar, Triple 4, continues to dominate the market, but the push for new cultivars is on-going. Several new lines will be tried out in 2000, including yellow and orange fruited cultivars.

Pepper prices started off well, but were depressed in May-June due to excess production in Holland and British Columbia as a result of a slow start due to cloudy conditions. During the remainder of the season prices were at or slightly below average. Overall 1999 (with the increased productivity) was an average financial year for greenhouse pepper growers in Ontario.

Pepper Pests & Diseases

Pepper crops had their full complement of pests including thrips, spider mites, aphids, bugs, and various caterpillars. Aphids were particularly abundant this year but a variety of natural

enemies helped to suppress their populations. In addition to Western flower thrips, another thrips species, *Echinothrips americanus*, was observed this year in a couple of operations for the first time. As for tomatoes and cucumbers, cabbage loopers was an ever present pest in this crop. Fruit damage caused by feeding of larval European Corn Borers (ECB) was observed in all operations but the level of damage was relatively low. Although Lygus bugs were observed in most operations, shoot and fruit damage remained low as well. During August, the Red-banded leaf roller was observed in one crop, boring into the stems of a few plants.

The most significant event in terms of diseases for peppers during 1999 was the occurrence of powdery mildew (*Leveillula taurica*) for the first time in Ontario, and perhaps, in Canada. Infections were at first in a few operations during early spring, and by fall, virtually all crops were affected. Increased and more severe infections by this disease appeared to follow periods of warm, humid conditions. Fusarium stem rot caused heavy losses in a few crops. Erwinia stem rot was also detected in one operation but improved environmental control helped to suppress this disease. Tobacco etch virus was diagnosed in one operation and losses were mainly due to downgraded fruit and some loss in yield.

Other Crops

Lettuce: The area of this crop is still small and growers are investigating alternative crops such as Oriental vegetables. Some growers are trying out cultivars that are different from those traditionally grown.

Strawberries: The potential of this crop is limited to those individuals that are prepared to do their own marketing.

Marketing:

There is increasing concern that greenhouse vegetables be not products of genetic engineering and the media and members of the public have had to be reassured by the Board that this is indeed the case.

To increase demand for greenhouse vegetables by the service industry, a pilot project that promotes tomatoes and cucumbers in this market segment will be initiated.

The Board has paid much attention to implementing a program that ensures the safety of greenhouse vegetables. This is patly an attempt to forestall any trade barriers that may arise due to health risk concerns associated with greenhouse vegetables.

Research:

Plant Pathology (Dr. Ray Cerkauskas)

Approximately seven commercial products are being screened for control of powdery mildew on tomatoes, cucumbers, and peppers.

The role of nutritional factors and pH on susceptibility of peppers to Erwinia and Fusarium stem rot is being investigated

Production and disease aspects of alternative crops such as water spinach and bitter melon

are being studied.

In vitro tests involving use of Virkon as a control for fungi and seed-borne pathogens are being carried out. Phytotoxicity tests are also being done.

Commercial trials with Sporodex for mildew control on cucumbers will continue in 2000.

Selective media for Penicillium will be used in further studies on the epidemiology of Penicillium stem rot in cucumbers.

Work is being carried out on a number of microbial beneficials against Pythium root rot by Dr. Mike Tu.

Engineering (Mr. Tom Jewett)

Approximately 6 ha of greenhouses suffered damage from this year's winter storm.

The Operating Engineer's Act was a source of controversy during 1999. Appointment of a new inspector has served to diffuse the situation somewhat.

Fuel prices are expected to increase by 25% in the near future. Large power companies are increasingly considering co-generation systems for greenhouse operations. Growers, however, have not yet shown much interest.

Work will continue on developing the protocol and software needed to integrate the various greenhouse systems.

Crop Management (Dr. Tom Papadopoulos)

A 4-yr co-operative study on tomato fruit quality will be completed next spring; series of experiments were conducted in Ontario, Quebec and B.C. The results suggest that an increase in the Electrical Conductivity of the fertigation solution up to 60% higher than the normal seasonal level is a reliable crop management strategy to achieve better fruit quality (firmer, better tasting fruit) at no yield loss.

Russeting trials were carried out in Ontario and Quebec. Reduced russeting was obtained with high concentrations of fertilizer in the irrigation water and lower leaf to fruit ratios. This cooperative research project will continue for two more years with series of experiments at GPCRC and seven commercial greenhouses (six in Quebec, and one in Leamington).

Use of the high-wire production system for standard or mini cucumbers was investigated for a second year. Difficulties are encountered in that fruit development is not fast enough to allow harvest before fruit bearing sections of the main stem are lowered and fruit touches the floor of the greenhouse. As an alternative, mini cucumber (15-20cm) cultivars were also tried but their horticultural traits were not satisfactory. Raising the crop support wires has also its limits, in consideration of worker's safety.

Tomato nutrition studies were focused on the Ca/Mg ratio effects on nutrient uptake, productivity and fruit quality. Preliminary analysis of the data suggests the need to revise the currently recommended application levels of Ca and Mg fertilizer.

Diurnal variation of the Electrical Conductivity of nutrient solutions was investigated as a tomato crop management tool. Preliminary results are encouraging (improved yield, and fruit quality).

The feasibility of deep water culture of numerous species of medicinal herbs, and the

effect of environment and nutrition on active ingredients are being studied, in cooperation with the largest hydroponic lettuce producer in the world (Hydroserre Mirabel).

University of Guelph (Dr. John Sutton)

There has been focus on re-circulating hydroponic systems using pepper, cucumbers, and lettuce.

The dynamics of Pythium, various beneficial microbes, and use of various disinfection devices are being studied.

The chemical nature of exudates from plants in re-circulating systems is also being investigated.

Greenhouse vegetable value (Millions of $), and production volume (Millions of Kg, or dozen), since 1988.

	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99
Greenhouse												
Tomatoes ($)	28	29	25	32	24	33	39	42	55	79	126	145
kg (000,000)						18	23	31	38	49	80	106
Cucumbers ($)	21	22	19	25	23	32	334	41	46	62	77.8	91.9
doz. (000,000)						4.4	4.7	5.3	6	8.3	9.8	11.9
Lettuce ($)	1	1	1	1	1	1	1	1	1	1	1	1
Sweet Peppers ($)	2	2	3	4	4	4	4	5	11	12	27	27.6
kg (000,000)						1.5	1.3	1.4	3	4.4	6.7	7.4
Sub-total ($)	52	54	48	62	52	70	78	89	113	154	232.2	265.5
Mushrooms ($)	80	85	76	74	77	85	90	105	102	111	112	117
kg (000,000)						32	34	40	36.5	36.4	37	37.7
Total ($)	132	139	124	136	129	155	168	194	215	260	344	382.5

B. Mushrooms

Ontario continues to lead the nation in mushroom production with 52% of the total production. Eighty three million pounds were sold in 1998, an increase of 3.5% over 1997. Farm gate value was $117 million, an increase of 5.3%. Fresh market price was $1.53/lb, an increase of 3.4 %. Processing grade mushroom prices increased to 0.88/lb, an increase of 13% over the 1997 low of 0.77. Total labor costs were 56 cents per lb of mushroom harvested, a decrease of 1.3%. Owners returned to the Ontario economy 46.6 million dollars in salaries and wages, employing 2075 full and part-time employees.

Mushroom production, in 1999, may be slightly greater with the fresh mushroom prices expected to be about the same as 1998. Processing price will remain about the same.

Ontario Mushroom Production

	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98
$$ Million	85.3	76	74.4	76.9	85.2	97.8	108.9	104.3	111.1	117
Kg Million	28.7	27.3	27.7	29.2	32.1	33	35	34.2	36.4	37.7

Trichoderma harzianum, biotype Th4, (green mould disease) persists at a background level with occasionally restricted outbreaks, some with significant economic impact.

Problems with both dry bubble disease (*Verticillium fungicola*) and mushroom flies (*Lycoriella mali*) have varied from farm-to-farm with the seriousness of the problem varying from year-to-year.

Specialty mushrooms

The specialty mushroom industry is comprised of generally small growers, producing oyster and shiitake mushrooms. No formal productions statistics are published in Canada. An educated guess would place the combined annual production of oyster and shiitake mushrooms in Ontario between 1 and 2 million pounds at a sales value of between $4 and 8 million. From the chairman's perspective, the specialty industry has overall remained rather stable for the past several years.

Competitor moulds (eg green moulds, whisker moulds), and flies continue to be problematic in both oyster and shiitake operations.

GREENHOUSE FLORICULTURE

The Ontario floriculture sector remained strong during 1999 with continued market growth and steady or strengthening prices of many crops. Both the domestic and export markets have been strong the past several years. The market was strong for cut flowers particularly roses at Valentine's but remained unusually strong throughout the summer and fall, times typically not strong cut flower markets. The potted plant held steady prices throughout the winter and spring. The bedding plant season started with a "bang" very early (late April) because of the fine spring weather. Fall pansy exports to the southern US were strong even though there was major hurricane damage. Some growers experienced some production problems initially because of the high temperatures but later because of the cool September which influenced the timing of the crop in the field. The past two autumn seasons have been exceptional in terms of growing conditions because of the warm temperatures and the exceptional light levels even throughout November and December.

The farm gate value of the Ontario production in 1990 was reported by Statistics Canada to be $246 million. For 1998, the reported value was estimated at $468 million. Ontario continues to represent about 50% of the total Canadian industry. In 1998, the farm gate value reported by Statistics Canada represents a 90% increase since the beginning of the decade for an annual growth rate of approximately 10%. Industry representatives predict this growth rate will continue well into the first decade of the new millenium.

Growth of exports continues with over $200 million shipped to the US market in 1998. The industry experienced a net trade surplus of $65.5 million. Flowering potted plants and bedding plants continue to be the two major commodities being exported. Flowering potted plants and bedding plants are now being routinely shipped to destinations as far south as Texas and Florida and as far west as Illinois and Indiana. Surprisingly, the export market for cut flowers has been rapidly expanding as well, particularly into the surrounding Great Lakes states using traditional marketing techniques. However value added cut flower products such as mixed flower bunches and pre-made arrangements focusing on a theme or holiday are experiencing even stronger growth.

Large expansions of new and existing production facilities were initiated in 1999. The expansion will be devoted to increased production of potted plants and bedding plants to meet the rapidly growing demand for product and according to some, allow growers to produce both an Easter and spring crop. Because of the very late Easter in 2000 it is almost impossible to grow the same crop volumes of both Easter and spring crops as past years without additional production area. In the cut flower sector, there has been modest expansion.

Much of the new production area has incorporated many of the latest technological advancements. During the past decade the Ontario greenhouse design/manufacturing/building firms have become world leaders in greenhouse structural design developing many innovative changes in terms of ventilation, and roof design. Growers have been incorporating some form of closed, recirculating subirrigation system for most of the new area dedicated to flowering potted plant production.

The financial woes of White Rose Nurseries which was of major concern last year because of volume of product purchased and sold through their retail outlets appear to have been resolved although many growers have been very reluctant to provide them with credit. The Ontario Flowers Growers Co-operative has successfully expanded into the export market to improve sales for their membership.

The industry has experienced more urban-rural conflicts than ever before. The success of the industry has made it more visible. Issues dealing with fan noise, tractor trailer traffic, stray lighting, micro-climate influences on adjacent outdoor crops and concerns about prime tender fruit land being covered over with greenhouses are all issues with which individual growers and the industry as a whole must grapple.

Some in the industry are concerned that USDA is using pest management issues, particularly quarantinable pests and diseases as non-tariff trade barriers. One large potted mum producer was quarantined both for domestic and export sales for several weeks because USDA suspected Chrysanthemum White Rust in a shipment costing the grower hundreds of thousands dollars of product being dumped, with no recourse for the grower. While no evidence of White Rust was ever found, certain cultivars showed symptoms of oedema that may have been mistaken as pustules of the disease. Unfortunately the USDA never admitted a mistake in identification was made.

Flowering Potted Crops: The market has been strong throughout this past year including even this summer when temperatures and weather favoured people living outside and at the cottage. Zonal geraniums, flowering potted mums and poinsettias remain the biggest crops produced. Because many new cultivars are being introduced with interesting colour and form, pot mum demand and prices have increased by 5-7%. The strength of the poinsettia market is very important because of large number of growers who produce this crop and is the only potted crop of major importance because of its popularity for the biggest holiday seasons of the year, American Thanksgiving and Christmas. Profit margin remains small with this crop. Both '98 and '99 have been exceptional seasons for poinsettia growers because of the good growing conditions, strong retail demand and mild temperatures for shipping poinsettias long distances.

Profit margins in general, are narrow for most flowering potted crops with growers achieving profitability through crop specialisation and volume production. Input costs such as fuel, labour and packaging/shipping have continued to increase while prices have remained relatively steady. Profits are determined by production efficiency, less crop diversification, economy of scale and use of technology.

Many other crops are in an expansion mode. Crops such as cyclamen, Rieger begonia, Kalanchoe, mini-roses and spring flowering bulbs continue to grow in volume produced and market popularity in part because many are no longer considered a specialty or holiday crop. Now, some that were only available for 4-6 weeks are now available for 4-6 months of the year.

Fall garden mum production continues to grow rapidly as consumers wish to add fall colours to their gardens beginning in late summer. Growers are struggling to meet the early demand for product and are now being forced to grow a portion of their crop in smaller container sizes indoors where they are able to use a blackout system to initiate flowering. Plants grown in 10L containers outside during the summer continue to be the most popular in the market. However, this size is very expensive to ship and as such continues to be produced more for the local market. The smaller sized product is being directed toward the mass market as a way to create market segmentation.

Industry growth is primarily in response to sales of floral produce by the mass market sector. The mass market, particularly many of the supermarkets, has dedicated floral departments and demand good quality, competitively priced floral products. However because most of the products are delivered to a central warehouse before being distributed a time delay occurs which too often results in loss of quality because of exposure to ethylene and remaining in an enclosed

box for three to five days at room temperature. It also means that growers must adopt production and distribution systems that are geared toward high volume shipping and offer the flexibility to change crops easily.

Weekly production of an increasing number of crops is occurring as consumer preferences and purchasing habits change. Weekly purchases of flowers are becoming more an integral part of the consumer psyche. In many ways the industry sees this as an advantage because growers are able to specialise in one or two crops and from the human resource and shipping perspective, the peaks and valleys are eliminated.

Cut Flowers: Cut flower prices have remained strong for the third year in a row for the "bread and butter crops" such as chrysanthemums and roses. The production area has remained stable. Cut flower growers are more optimistic about the future than for many years.

Demand for cut spray mums and roses improved again this past year. Renewed interest in spray mums has occurred as improved cultivars and colours have been introduced and their importance as a staple item in market bunches increased. Creating a demand for pre-made market bunches using a variety of cut flowers and greens, both domestic and imported, has been a very important development because consumers enjoy the more informal nature of mixed flowers in a vase.

Cut mums continue to be grown in soil but changes in propagation and growing-on technologies have improved cropping efficiencies in the production areas. New European cultivars that mature more quickly and have good colour and form have been of benefit to the sector.

Rose growers during the '90's have rapidly switched the majority of their production from the soil to growing in coir (coconut fibre). In addition, they have changed their cutting and plant management practices that have improved the quality of roses produced so that they are better able to compete with the South American produced rose.

Production area for non-traditional cut flower crops continues to steadily expand. A modest increase in gerbera production has occurred this past year as growers either expanded their production areas or switched from another crop. Gerbera, both the regular and mini types, has become very popular but is not an easy crop to grow and the flowers are difficult to ship long distances.

Snapdragon, a cool season crop, is a renaissance crop that is now being widely grown by many smaller growers. This popular cut flower of the 1950's and '60's has made a dramatic resurgence in popularity during the '90's. Unfortunately for Ontario growers, some of the best performing winter cultivars for our light and daylength conditions are being withdrawn. There are no superior cultivars on the immediate horizon. Canada remains one of the major producers of this crop.

Many other cut flowers remain very steady in production and pricing including alstroemeria,

Asiatic and Oriental lilies, freesia, iris and spring flowering bulb crops (tulips, daffodils).

There are many niche cut flowers that individual growers are very successful in growing and marketing, sometimes only during a certain season, including Limonium, Delphinium, Larkspur, "Gypsy" Dianthus, Lisianthus, Matsomato Asters, Stocks, Statice, Celosia, Astilbe and Sunflowers to name just a few. The most common grower complaint is that very little technical information on growing these crops is available.

Outdoor cut flower production for the fresh market as well as the dried is growing rapidly. It is an area that few in the floral industry have a good understanding of the size and scope of the sector.

Bedding Plants: The market for annual bedding plants and perennials continued to grow. This year sales were exceptional. For the second year in a row, spring came early with warm, sunny and dry conditions that encouraged consumers to get the gardening itch early. Demand began before product was really ready and remained strong throughout the 5-6 week sales season making it difficult to always provide product in flower. From Easter until the end of May was an incredibly busy time for most growers. However, when the hot weather hit early June, the market softened dramatically.

The production of bedding plants continues to increase faster than the production area because of a number of factors including changes in flat sizes and the utilisation of various sized plugs (individual seedling transplants). This past year many larger growers installed mechanical transplanters as a means of dealing with the labour and time crunches that always occur. However, the impact of all this is the need to have the tools to produce uniform, consistent seedlings. This requires high quality seed, proper production facilities, and a qualified growing team. However, the industry is dealing with biological entities not widgets that can result in considerable variation if informed decisions are not made.

There has been a flood of new and unique vegetatively propagated plant introduced to the Ontario market place from around the world that is ideal for growing in mixed hanging baskets, window boxes and patio planters. However, production costs have increased. Many growers are frustrated with the lack of production/management information for many of these plants that has required considerable effort on the part of growers to learn how to grow properly. This past year tobacco mosaic virus (TMV) was an issue in crops of vegetative petunias and related species.

Greenhouse production of perennials continues to grow rapidly. However the market is demanding that the vast majority of product to be in bloom while at the same time be compact at shipping. Greater knowledge on juvenility and environment manipulation is needed to control flowering of plants that are day length/light quality responsive. Label expansion of growth retardants to include perennials is needed.

A degree of market segregation for all bedding plants is occurring as growers attempt to differentiate product for the upscale garden centres from that of the mass markets. For example,

many growers are growing a larger basket (12" VS 10") or a fibre basket for the upscale market with mixed plant material and the traditional 10" with a single plant species for the mass market. The spring bedding plant market is still dominated by Impatiens, petunias, marigolds and zonal geraniums. Demand for zonal geraniums continues to grow rapidly because of its strong garden performance. This past summer and early fall, the presence of bacterial wilt of geranium caused by *Xanthomonas campestris pelargonii* was identified in new stock received from one breeder creating a major shock wave and crisis throughout the industry. There may be a shortage of cuttings and finished product in the spring of 2,000.

LOW ACREAGE & SPECIAL CROPS

The area of minor crops, like most areas of agriculture, continues to struggle against increasing costs-of-production, unregulated and volatile commodity prices, and the lack of adequate pest control products to compete with the American counterparts.

There is an increasing demand by way of consumers to be able to choose Ontario produce, and the supermarkets are giving over to more locally produced produce at the discretion of individual store locations.

Low acreage but main-stream vegetable production such as cucumbers, peppers, and melons, for example, continue to find market share in a very competitive environment. This in part is due to the diligent efforts of growers to find efficiencies. Other more niche-market vegetables are finding homes in the greater Toronto area as a result of the ethnic diversity. The learning curve for these niche vegetables is often very steep as usually the research and expertise doesn't exist to help these growers out.

Very often growers in Ontario are supplying a market-place with quality products that not only meet U.S. #1 grades, but often exceed them.

MUCK CROPS

State of the Industry- Seed co. representatives and growers discussed major challenges of 1999 growing season. The 1999 season in the Holland Marsh and the Thedford/Grand Bend Marsh was one of the warmest and earliest on record. This led to many drought related pest and production problems. Excessive heat caused carrot seedling burn-off during April /May forcing carrot growers to re-plant 2-3 times. Irrigation has become an important management tool for crop production. Onion thrip control was again a major challenge for growers in the Thedford- Grand Bend Marsh.

Production Statistics: The 1999 acreage for Muck Crops and 1998 Farm Value for Ontario is shown in Table 1. (OMAFRA Statistics)

Crop	Acreage Harvested '99	Farm Value '98 ($'000)	
Total carrots	7,580	fresh & processed	17,395
Celery	665	f & p	3,760
Leeks	130		1,100
Total lettuce	600		6,030
Dry onions	6,020		x
Green onions	400		2,570

Carrots:

Industry experts have called carrots in the '90's, the "Cinderella Crop" in Ontario. The growth of the "Cut N' Peel" carrot industry is projected to expand to approximately 2500 acres on highland mineral soils near the Bradford Marsh. Packers are test marketing Nantes variety "X –tra Sweet Carrot" packs and a major grower/packer is launching a "Carrot –Apple Juice Mix" product in December 1999.

Production problems in 1999 included heat canker/burn-off, drought, cutworms, carrot rust fly, and carrot weevil.

Lettuce:

Thanks to increased market pressure from Quebec and California imports, the Ontario lettuce industry has been steadily declining for the past 10 years. There has also been increasing pressure by the retail industry for Ontario lettuce to be wrapped. The OMAFRA, Food Inspection Branch surveyed 171 retail stores across much of Ontario during the months of July and early August 1999, looking at origin and packaging of head lettuce being sold. The results of the survey indicate that the Ontario grocery retail industry moderately supports Ontario lettuce during our growing season. While wrapped lettuce is a broadly accepted method of packaging lettuce for sale in Ontario, no Ontario lettuce is wrapped prior to the retail level of trade. Despite the decline of Ontario lettuce, it still remains an important "niche" crop for many growers. Marketers realize that having "Fresh, Quality, Ontario Lettuce" on the grocery shelves in early summer, is an excellent way of inducing consumers to purchase Ontario carrots, onions, and celery in the late summer/fall.

Celery:

Celery acreage in Ontario has been expanding over the past few years. The development of celery fusarium disease resistant varieties, and growth of the celery processing industry in Ontario and USA, have been major reasons. Some growers feel that the expansion of celery could replace the acreage that was allotted to lettuce.

Onions:

Onion acreage on the muck soils remained stable in 1999, but onion acreage on highland mineral soils has increased. Some of this onion acreage increase has taken place in Simcoe Co., in

rotation with potatoes. There were approximately 500 acres of early onion production from transplants, which were being harvested by late July-early August.
Most of these onion transplants were grown by greenhouse operations in the Leamington area. There has been a growing trend of purchasing Ontario produced onion transplants, instead of Georgia or Texas transplants. Major challenges to onion production included drought, and onion thrips, which resulted in lower yields. Disease pressure was low in 1999.

NURSERY/LANDSCAPE & TURFGRASS

The nursery, landscape and turf industries in Ontario are comprised of the production and retailing of shrubs, trees, herbaceous plants and sod, and the maintenance of related landscapes and recreational areas.

In 1998, farm gate sales of nursery stock in Ontario totaled $136,000,000, which accounts for 40% of national sales. This was an increase of about $13,000,000 from sales in 1997. The land base devoted to this production was 15,000 ha, a decrease of 12% from 1997. Sod sales were $32,760,00 from 4,500 ha (a 16% increase in sales on an 18% increase in land base from 1997). (Nursery Trades Industry Statistics, Ontario and Canada, 1996-1998 - OMAFRA). The value of related services in nursery, landscape and turf continue to be grow. The industry survey project being developed by K. Nentwig has produced a very preliminary estimate of as much as $6 billion for the value-added component of the nursery/landscape/turf industry on a farm gate of about $200 million.

The 1999 growing season was characterized by a mild winter followed by an early, warm, and dry spring across Ontario. This was followed by the second of two of the driest summers on record. The fall, in turn, was again milder than normal, with record warm temperatures, though rainfall returned to normal. Nursery growers and garden centres reported good sales in a long season.

Because of the long, dry summer, the lawn care, grounds maintenance and landscape contractors had a challenging year, particularly in dealing with water supply and water quality concerns. Many municipalities had watering bans or mandatory alternate day watering programs. Finding qualified labour to deal with increased demand continues to be a problem in these seasonal industries. The lawn care industry appears to have flattened out in terms of growth of opportunities or new operators.
The nursery and garden centre sector had a good year in 1999. A long season and good conditions led to, at times, too much growth, with oversized plants. Demands on urban arboriculture continue to grow and at times outstrip the supply of trained staff. Pathology and drought related problems are increasing, and sometimes the easiest (thought not necessarily the best) solution is to cut trees.

New sports fields and outdoor community recreational areas continue to be developed. There is ongoing concern that the specialized construction requirements for sports fields are often poorly understood or ignored for budgetary reasons, leading to long term problems and even failure of

new installations.

The sod industry, as a sector, was strong in 1999. This was fueled by a long season and increased demand to deal with damage from drought and insect stress. Sod quality was a concern in some geographic areas where water restrictions and lack of irrigation combined with low rainfall to limit the ability to harvest quality sod. Price increases in sod may be anticipated in 2000, due to low inventories and increased demand.

The golf course sector had a good year in 1999, with significantly increased rounds because of the long season. There is concern about the drought conditions in 1999 and the prospect of such conditions being a long term problem, especially in the context of water use restrictions and a tightening of the permitting process.

The nursery, landscape and turf industry is confident and will continue to make a major contribution to the economy of the province in 2000.

POTATO

Acreage and Varieties.

There are approximately 275 commercial growers in Ontario who grew about 43,550 acres of potatoes in 1999. The value of the crop is approximately $62,000,000.

About 55% of the acreage is for the tablestock market and 45% for the processing market.

The main potato-production areas in the province are Alliston, Shelburne, Leamington, Ancaster, Simcoe-Scotland-Burford, Grand Bend and Mount Albert. Potato production is also located in northern areas such as North Bay and Sudbury.

The main varieties grown for the fresh or tablestock market are Superior, Yukon Gold, Kennebec, Norland, Chieftain and Goldrush.

Due to processors' demands, the chipstock market has seen a turn around of varieties. Snowden, which used to be the standard variety for potato chips, is now being replaced by proprietary Frito-Lay varieties. Monona, an old chipping variety with limited acreage in previous years, seems to be on the increase.

Shepody continues to be the main variety grown in the Shelburne area for the processing market, ie. for soups, stews and pre-peel sales.

Only 800 acres of GM potatoes were grown in Ontario this past season. Some growers were pleased with the performance of these varieties, others will not grow them again because of problems: uneven tuber shape, variable seed dormancy or susceptibility to pink eye.

The Integrated Pest Management Program.

A total of 26 scouts monitored approximately 13,000 acres of potatoes in Simcoe and Dufferin counties. The intensive field monitoring allowed growers to anticipate problems and to spray only when strictly necessary. The scouts were trained by the OMAFRA Potato Specialist. The salary of the scouts was paid by the growers. In 1998 and 1999, The Rural Job Strategy Fund

program provided some funding for the scouting program to the growers' associations to offset part of the cost of salaries.

Production Problems in 1999.

The season was too dry and too hot for the potato crop. Low water tables and low rainfall resulted in irrigation-water shortages. As a result of the drought, yields were disappointing, but the quality was excellent.

The main pest problems in 1999 were early blight and the potato leafhopper. The high incidence of early blight was due to the drought stress that affected the crop most of the season.

Leafhopper populations have been increasing for the last 3 years. Field scouting and timely sprays avoided leafhopper damage.

Because of the hot, dry weather, late blight was not a major problem. Only a few fields developed the disease at the end of August when the weather turned wetter.

Ontario Potato Board.

The Fresh and Processing Boards were amalgamated to form the Ontario Potato Board. Don Brubacher is the General Manager, Wayne Dorsey the Chairperson and Kevin Marcoux the fieldman.

As of 16 December 1999, the Board will be operating from a new office in Elora.

Seed Potato Industry in Ontario.

Although most Ontario seed-potato growers are members of the Ontario Potato Board, they continue to be represented by their own Association, the *Ontario Seed Potato Growers' Association.* In 1999, certified acreage was approximately 1000 acres, down 8% from 1998. Seed sales to commercial growers were brisk with generally good field performance.

The Association offers 27 different potato varieties to commercial growers and sales look promising for spring 2000, with the exception of GM potatoes. Sales are uncertain due to the Green Peace campaign to create public doubt and reduce the processing volume of GM potatoes. Frito Lay, the largest potato chip processor in Ontario, is granting more contracts for exclusive use of Frito Lay seed lines from their private seed company. A couple of Ontario seed growers are now increasing these FL lines for seed.

SWEET CORN

The spring of 1999 was early and warm, which resulted in ideal conditions in April and all of May for seeding sweet corn. The early part of the season was so conducive to field work that it appears many growers had time to plant more corn they would ordinarily have done. Seed companies indicated that sweet corn sales were up 10-20% this past year, and consequently there was an over-supply in the market-place. Bicolour corn is still the overwhelming choice among consumers although demand for yellow corn is up slightly over last year. Sh_2 (shrunken) are still the main sugar- type planted in Ontario, with Candy Corner a good example; however, Se (sugar-enhanced) varieties are also still important. Sweet Chorus, a Harris-Moran "Sweet Breed" has also done well as an early variety. OMAFRA statistics suggest that 73% of sweet corn acreage in Ontario is processed.

Sweet corn was a more expensive crop to produce in 1999 relative to previous years. Hot and dry weather conditions made it necessary to put considerable money and effort into irrigating. Other irrigation expenses included deepening ponds, and purchasing new or up graded equipment in order to keep up with the demand for water. Controlling European Corn Borers was also expensive this year since they showed up early, had shorter than usual generations, and were sprayed for on a tighter interval. This is was in part due to insect pressure as well as the lack of residual activity by insecticides in the heat.

Because of the heat, harvest intervals were shortened and scheduled plantings tended to come at closer intervals than intended. Corn grew at maximum rates, and dates of maturity were on the low end of the range. At times fields would be bypassed due to poor quality because of a lack of water or there was simply too much corn to physically harvest or be absorbed by the marketplace. Ear size and tip fill were both poor this year due to lack of moisture.

The use of plastic mulch was very common this year, and probably showed an increase in use over last year. However, due to the early warm spring, the advantage of plastic mulch in promoting earliness was not evident. Most growers are using mulch as a competitive advantage among themselves, and the fact that most growers are now using plastic mulch has removed the advantage that a few once had. Plastic mulch has become an expensive habit, with decreasing returns as more and more farmers use mulch as a standard production practice. On average, the use of mulch adds about $200/acre to the cost of production of sweet corn, while the return per bag does not reflect that cost.

Due to the warm season, early sweet corn matured in time to meet U.S. imports, resulting in prices getting off to a poor start, and not improving for most of the season. Although corn ranged between $8 and $12/bag (5 dozen), $8 was more common, and $6 was not uncommon. Roadside corn settled in at about $2/dozen although it started off at $5 to $6/dozen for some of the earliest. Some of the farm markets have been able to achieve between $3 and$4/dozen.

The popular press has delivered more about GMO's (genetically modified organisms) this past year than in the 10 years previous. This issue affects sweet corn due to the availability of Bt sweet corn. There are still very few Bt sweet corn cultivars available, and only about 2% of the fresh-market corn was Bt while about 40% of field corn had the Bt component. Growers and processors continue to be wary of consumer acceptance.

Stewart's wilt of corn has generally been of no concern in Ontario over the years and only showed up marginally in 1998. The second mild winter in a row has allowed a larger population of corn flea beetles (the vectors of stewarts bacterial wilt) to overwinter in Ontario, resulting in an increase of the disease. It was found in Essex, Kent, Lambton, and Niagara this year, with a complete loss in a few fields, and significant yield reductions in several others. A concerted effort at education this winter will be needed in order to ensure that growers are prepared for a higher incidence of stewarts wilt in 2000, provided we have another mild winter.

Most areas saw moderate populations of corn borers through the season, which were not too difficult to control. Corn earworms arrived in Elgin county on 20 July, and spread quickly across southern Ontario, building up to record high levels by the end of August. The main difficulty with insect control was the constant temperatures over 30° C, which resulted in short residual activity for insecticides.

Sweet corn insecticide applications have been blamed for some large bee kills in southern

Ontario in 1999. This problem was worse in 1999, which was felt partially due to the weather. More residual insecticides were used due to the heat, and bees were noticed in sweet corn fields, which is not common, but happens when there is nothing else available. The Ontario Beekeepers Association expressed frustration in that they work hard to provide a pollenation service for the fruit and vegetable industry in Ontario but feel they are being sabotaged by another segment of the industry. A mediation effort including processors, aerial applicators, and beekeepers is working to prevent this from happening again.

TENDER FRUIT

The weather in Niagara recorded at Vineland Station and around the province was similar to 1998, warmer and dryer than normal. The winter was good for tender fruits as the minimum temperature recorded was - 15.1 C. on January 10th and 11th. January also provided some needed moisture, as the total precipitation was 125.8 mm, double the 80-year average. February and March were 28 % dryer than the 80-year average and also warmer with a high reading of 22.4 C. on March 31st. April was about normal, however the season was pushed ahead of normal. Temperatures during May and June were also warmer by an average of 2 C. compared to the 80 year average and 39% dryer. That led to an early bloom period about 9-12 days ahead of normal.

The month of July turned out to be a key month. After coming out of a dry spring, the month of July had 78.8 mm of rain, 10.6 mm above the 80-year average. This was critical as the following August was significantly drier than normal. Two significant rainfalls were recorded at Vineland in the last week of July but rain throughout the summer was hit and misses for the Niagara Peninsula. There were two isolated hailstorms in late July and early August, which caused some damage to fruit crops along the Niagara River. Fortunately, the growing season was ahead of normal by 10 days and there was minimal damage to fresh market peaches and sweet cherries in the area. Most of the processing peaches were salvaged but fresh market peaches had to be re-thinned. The fall season was close to normal for temperatures but above average for precipitation (September + 50%, October + 55%) should help the trees as they head into the winter of 1999-00.

Fruit trees came through the winter in good shape and with plenty of crop potential. A warm spring created some anxious moments as early blossoms were subject to spring frosts. There were only a few areas that reported significant damage. There was a wide range of fruit set within the peninsula but most blocks required normal thinning to balance the crop.

Most crops benefitted from irrigation during July and August as the dry periods reduced some crop potentials. The number of users on the Niagara-on-the-Lake Irrigation System increased significantly again. The early sweet cherry crop had smaller than normal fruit size and was damaged by birds but very clean and required little grading. The Japanese and European plum blocks came up with good crops but had fewer premium size than normal. The sour cherry crop was very heavy and of good quality.

Peaches and nectarines had good crops but small fruit early in the season. Many irrigated

orchards harvested large crops with excellent quality. There were fewer problems this year for marketing as processing varieties were mainly sent to the processor. Pears were heavier than the last couple of years with good fruit size.

1999 Ontario Tender Fruit Producers' Marketing Board Report

Fresh Market

Fresh peach volume was up5%, Japanese plums up 48%, sweet cherries up 77%, and Bosc pears are estimated to have increased by 16% from 1998 levels. On the down side, Bartlett pears were off 12%. Blue plums and prunes remained the same.

The 1999 peach crop marketed through the dealers amounted to 1.52 million 6x3's compared to 1.45 million in 1998. The crop did not reach its full potential. Early season varieties came in at about 100,000 masters below estimate due to smaller fruit size resulting from drought conditions. Mid season varieties, which benefitted from timely rains, produced a large crop but still below potential. Late season varieties exceeded earlier predictions. The board requested that the minimum fruit size remain at 2 1/8" for an extended period because of the smaller fruit size but was moved back when larger peaches were available. There was a huge supply of basket peaches and a shortage of bulk containers. Consequently, there was a strain on basket sales during the peak of the season.

Yellow and blue plums were marketed in an orderly fashion but black knot continues to take its' toll on tree numbers. Pear fruit size was generally disappointing and a higher number of pears were diverted to the processing market.

Tender Fruit Processing

Volumes delivered to processors in 1999 showed an increase in clingstone peaches of 14% to 7700 tons, an increase in pears of 17% to 4000 tons, an increase in sweet cherries of 36% to 400 tons and a huge increase of sour cherries by 82% to 8116 tons.

1999 Nabisco St. Davids Report

As with the '98 season, the clingstone peach and pear crops of Niagara had an early start to the season. The peach trees in the Niagara Region recorded full bloom on May 8, 3-5 days ahead of average and 12 days later than 1998. Crop heat units to August 1st were 2,365, compared to our 30-year average of 2,121 CHU's, or 10 days ahead of normal. The first day of local peach delivery (Vulcan) was July 27th. Peak harvest dates of Veecling, Babygold 5 and Babygold 7 were August 13th, September 1st and September 4th, respectively. This was approximately 8 days earlier than 'normal', but 7 days later than '98's experience.

The 1999 processing pack season has generally been considered successful, albeit more stressful than normal due to increased volumes. A brief overview of this year's highlights (and lowlights) is as follows:

- Record fresh fruit tonnage season – 134% of '98 and 127% of '97 (St. Davids' previous

record volume).

- Sales continue at double-digit annual increases, particularly for 5 oz. fruit cup products.
- Approval for building replacement / expansion – 1st phase of planned 4 year program. Ground breaking occurred in October '99.
- Provided January 'contracted cling. grower' guarantee for minimum pricing levels, plus premium levels for 'oversize' fruit and super-early variety (Vulcan).
- Significant increase in interest to plant processing fruits, both within and outside of the Niagara region.
- Completed production of new flavoured product "Mandarin Magic" scheduled for January 2000 market introduction. Product to compliment "Very Cherry", introduced in '98. New products will continue to place added need for increased local tonnage.
- Grower plantings of CanAdapt Fireblight tolerant pear project completed in spring '99.
- Leased the former Riverscourt Cold Storage facility to assist in the increased pack volumes.
- Dry conditions throughout June, July and August impacted fruit sizing potential. However, conditions attributed to providing low brown rot and bacterial spot levels throughout season.
- Two hailstorms in Niagara-on-the-Lake affected approximately 400 tons of cling peaches.
- Increased incidence of split pits throughout the season, but particularly for the Veecling variety resulting in orchard and factory losses. New peach pitter equipment trial for improved performance in handling split pits was less than successful.
- Experienced unfavourable raw product recovery and plant throughput with cling peaches. Attributed mainly to small fruit sizing of the heavily set BG 5's.
- Considerable pressure for cold storage space and cooling capacity throughout September due to bunching of BG 5's, BG 7's and California imports. Peaking at 3,800 tons in storage. Experienced minimal decay losses, considering the volume that was at risk.
- Completed initial study on "field run pear pricing schedule"- Univ. of Guelph, Vineland.
- Obtaining suitable seasonal labour for the processing plant was difficult throughout pack.
- Less than favourable canned quality results for HW614 pear variety Favourable pear recovery and cold storage holding to-date, mainly due to quality of Washington pears.
- Uncertainty with the plum pox situation
- Pear pack expected to be completed on December 15th

Raw Product Summary:

Product	Source	1998 Tons	1999 Tons	% of '98
Clingstone Peaches	Domestic	6,223	6,985	112
	Imports	3,241	5,393	166
	Total	**9,464**	**12,377**	**131**
Processing Pears	Domestic	3,066	3,728	122
	Imports	6,366	9,277	145

Total	**9,432**	**13,005**	**138**

TOMATOES

1999 was a difficult growing year because of dry weather, hot temperatures, blossom end rot and hail. Approximately 1000 acres of processing tomatoes were hit by hail in Kent county. This caused quality problems for the whole-pack industry. Blossom end rot was a common problem in 1999, especially in the early harvested crop. Problems with bacterial diseases continue to be a concern. The fresh market industry faced similar problems. The fresh market crop was harvested earlier than normal because of the hot weather. Prices were reported to be about normal.

The combined farm value for both processing and fresh market tomatoes in Ontario for 1998 was $69,807,000. This represents a decrease of approximately 0.4% from the 1997 value of $70,110,000.

a) Processing Tomatoes

During the 10 year period from 1989 to 1998, the provincial average yield increased by 89%, and the industry attributes much of this increase to research that has resulted in improved varieties and better cultural practices. In 1999, yield of processing tomatoes (32 ton/ac) was down, however, this is a response to climatic conditions (dry weather, hail) and not a result of maximizing the yield potential for tomato. Processing solids were up from last year which helped to compensate for the reduction in yield. Processed tonnage was approximately 5% below contracted tonnage in 1999.

Table 1. Recent trends in the Processing tomato industry in Ontario: (Sources: O.V.G.M.B., OMAFRA Publication 20 and OMAFRA website)

Year	Contracts	Measured Acres	Processed Tonnage*	Avg. Yield (tons/ac)	Gross Farm Value
1991	264	20,680	450,000	21.8	$52,502,000
1992	289	17,270	420,000	24.2	$43,492,000
1993	275	19,206	510,000	26.5	$53,040,000
1994	237	19,834	575,000	28.9	$59,336,000
1995	228	18,578	578,000	31.0	$60,619,000
1996	222	15,940	502,000	31.2	$52,475,000
1997	192	14,800	497,000	33.3	$50,310,000
1998	183	15,060	562,000	37.0	$58,941,000
1999	187	16,866	544,636	32.0	

* includes fresh market acreage.

b) Fresh Market Tomatoes

The reported acreage of fresh market tomatoes decreased sharply in 1998 and increased in 1999. The Subcommittee does not know why there was this fluctuation in reported acreage. The farm value of the crop also decreased in 1998.

Table 2. Recent trends in the Fresh Market tomato industry in Ontario: (Source: OMAFRA Publication 20 and OMAFRA website)

Year	Harvested Acres	Farm Value
1991	5,597	$23,215,000
1992	7,500	$32,055,000
1993	5,910	$43,633,000
1994	6,308	$36,705,000
1995	5,217	$26,454,000
1996	5,714	$22,603,000
1997	5,500	$19,800,000
1998	2,325	$10,866,000
1999	4,000	

EMERGING ISSUES

AGROFORESTRY

Maple industry

Maple syrup production for the year 2000 season will likely be low due the drought in 1999. Although trees are going into the winter relatively free of moisture stress, trees are likely very low on food starch reserves. It will likely take at least one normal summer for sugar maple trees to recover from the double drought. Producers may focus on the long-term health of their sugarbush, by once again, reducing or not tapping this coming January. Professional opinions will be sought on the matter prior to the season.

Pest Management: The Asian Long-horned Beetle emerged as a very frightening bit of news to the Ontario maple producers and the entire forest and landscape industries. Work should continue to ensure we are ready for prompt action should this foreign beetle appear.

Nut Production (managed commercial orchards)

Commercial nut production is proving to be profitable for the few who are marketing sweet chestnuts, grafted walnuts and to some extent, heartnuts. A good cracking machine is still a

primary stumbling block for large-scale production of heartnut. Some supermarkets are stocking specialty walnuts, such as 'The Old Walnuts'. The old walnuts are actually old selections, cultivars of our native black walnut and are greater than 600% more productive than wild native walnuts when grown in managed (and sprayed) orchards. Pecans also are showing good results at one Essex county orchard and in Niagara Nurseries. SONG would like to increase the number of private-land pecan plantings in Essex and Kent counties, north shore Lake Erie, where the frost-free season permits nut ripening. OMAFRA has realized that availability of pest control products is limited and requires a number of URMULE registrations. Even dormant oil isn't available to nut growers. Agroforestry extension will focus on getting the registration process started.

Christmas tree farmers

Pest management: The invading Pine Shoot Beetle has caused restrictions of movement for producers with export markets. Assistance should be provided to the Christmas tree growers to enable them to sell their product. Fumigation prior to shipment is an option, but, are other non-chemical methods available?

Urban Invasion of Forest, Habitat and Farmland

Movement of urban people into rural and wild settings is causing concern for both preservation of natural habitat, managed forests and preservation of farmland. There is no shortage of these urbanized people who are claiming ownership of all the landscape they see and are dictating what goes on. MNR, OMAFRA and Conservation Authorities of the Agroforestry Subcommittee agree that eventually governments will have to act on this issue. Perhaps a stiff 'farmland, forest and habitat invasion tax' for building companies and home buyers in these areas could help reduce urban sprawl and loss of our very valuable and non-reclaimable resources.

University of Guelph, Agroforestry Group (Naresh Thevathasan)

Interactions at the tree-crop interface associated with the growth of trees are continuing to be investigated in relation to intercrop yield. Recently completed research work on competitive interactions (Simpson, 1999) at the tree-crop interface suggests that most of the negative interactions (e.g. competition for light and moisture) closer to the tree rows could be potentially reduced or eliminated through proper management strategies. A few management options recommended are: increasing the tree-row spacing, pruning, appropriate tree crop selection, disk pruning lateral roots etc. Therefore, more research work is needed to evaluate these recommended management strategies against the intercrop yields.

OMAFRA extension – distinctions between intercropping systems (Todd Leuty)

Applied Intercropping: Profitable intercropping systems using food-bearing trees with annual crops is well established within orchard management. Although terminology is new, orchard farmers are recognized for developing intercropping techniques. There are currently no reported problems resulting from intercropping and remains an old yet profitable practice. From a forestry perspective, orchards are intensively managed hardwood plantations. The intercropping

technique can be adapted to non-food-bearing trees with a fair understanding of associated costs and benefits to the landowner (See the OMAFRA agroforestry web-site, 'Intercropping trees and annual crops').

Environmental Intercropping: Environmental intercropping as currently researched, is recognized by an Extension perspective as 'ecological restoration leading to reforestation' and is unlike applied economic intercropping using food-bearing trees. Ecological restoration of habitat and forest cover is a useful objective for many rural lands. Further distinction between Applied intercropping and Environmental intercropping is available upon request.

APICULTURE & POLLINATION

1. Furadan aerial application on sweet corn: Pesticides are used on agricultural crops to alleviate the pests of plants. Unfortunately, the honey bee is susceptible to many of the used pesticides. When these pesticides are used on crops, honey bees are subjected to chemical poisoning when collecting nectar and pollen from flowers. Consequently, the field bees are killed in the field or at the entrance of the hive. In some circumstances pesticides are brought to the hives by the foragers and they may kill brood and young bees.

In 1999 Furadan used on sweet corn killed 847 bee colonies in Southwestern Ontario. This represents 1% of the total of bee colonies in Ontario. Regulatory action must be taken to get the farmers, beekeepers, OMAFRA advisors and pest applicators to cooperate closely to keep losses of honey bees to a minimal. Effective steps and clear labels for pesticides must be considered to reduce poisoning of bees.

APPLES

Food Quality Protection Act

The Food Quality Protection Act (FQPA) was passed into law in the US in 1996. It requires that all existing pesticide tolerances be re-evaluate for risk using much stricter standards - a third by August 1999 and the remainder (9,000 in all) by 2006. Organophosphates (Ops) and carbamates are just the first classes to be considered. How they are handled will set powerful precedents for decision-making processes for other compounds.

The EPA is assessing risk of pesticides based on all the uses of a given product, combining agriculture, lawn, and household uses. Also, possible exposure to other pesticides with similar modes of action will be combined to present a total exposure package, known as the "risk cup". Once the "cup' overflows, the risk must be lowered by eliminating some or all uses of the product. Special considerations is also give to a chemical's impact on infants and children. Fruit growers generally have no argument with the goal of FQPA: to protect human health. But, if

implemented using invalid models or inflated theoretical estimates of pesticide usage and exposure, the "risk cup" quickly overflows.

The unnecessary elimination of pesticides that are essential to producing fruit through reduced-chemical integrated pest management programs could drive growers out of business, raise food costs, and actually have adverse environmental effect.

This issue hangs over our industry like a cloud. The impact on the Ontario apple industry of the sudden elimination or tightened restrictions of key pesticides could be severe. We are unsure of the availability of viable pest control alternatives, their effects on IPM programs and resistance management, production cost increases and/or yield reductions for producers, the impact on the industry's ability to meet quality standards for both domestic and export fresh and process markets, market dislocation that may result, and the industry's overall ability to adapt.

Sevin, is one example or a carbamate that Ontario apple growers would suffer adversely from it were no longer available. Sevin is used for chemical thinning apples to regulate the number of apples on the tree and hence, improve fruit size. Since Ontario exports a sizable quantity apples to the US, they may not be willing to accept apples treated with Sevin if this product were not permitted in their own country. Therefore, while the FQPA is a law enacted in the US, the spillover and potential effect on Canadian Agriculture is tremendous.

Food Safety

Ontario produce and related products have enjoyed an excellent reputation for food safety. Recently, however, there has been an increase in food borne illness linked to fresh produce including juice and cider. Newly emerged food borne pathogens such as *Escherichia coli* 0157:H7 have gained world-wide attention and have tarnished public confidence in the food system even though many of these organisms have existed in one form or another in the past. As information on the food borne pathogens becomes available, programs are being developed to mitigate their impact. These include codes of practice, good manufacturing practices (GMPs), hazard analysis and critical control point (HACCP) programs.

Genetically modified organisms and their use in agricultural commodities also represent a larger food safety issue. Public attention is being directed towards universities, government and industry to ensure food is safe. The agriculture education and industry sectors must be proactive in educating the public that Ontario produce is safe. As one member stated in relation to the wider food safety issue, "we must be steering the ship rather than merely be passengers on it."

It is very important that resources continue to be directed towards research, preparation and implementation of food safety programs. Information must be distributed to industry members as quickly as possible.

Review of the tree fruit pathology program - AAFC and University of Guelph, Vineland

New chemistries are being used and evaluated for apple scab control. Less is known about the control of other apple diseases with these products. These include powdery mildew (some data

here), cedar apple rust, sooty blotch, fly speck, black rot and various tree cankers and rots. To a certain extent old fungicide programs looked after these problems. A movement toward a narrower spectrum of activity aimed at apple scab would lead to a resurgence of these "minor" diseases. This would require separate products for their control with all the associated costs and technology transfer. "Registration research" is done largely by industry and is aimed at the major disease problem i.e. apple scab. We need to examine the efficacy of new products against more than just this one problem. Growers will have to be educated to be vigilant for outbreaks of "minor" problems. A narrow spectrum of activity could also lead to increased chance of resistance to new fungicides. Resistance management strategies will need to be developed along with the diagnostic tools to detect/monitor resistance. All of this comes at a time when the future of the fruit pathology program at AAFC, Vineland is uncertain. The only full-time scientist working on tree fruit pathology presently is nearing retirement while a contract position in pathology may be discontinued.

Fireblight

Several of the newer apple cultivars introduced recently such as Royal Gala and Gingergold exhibit more susceptibility to Fireblight than Macs/Delicious/Spys. Coupled with this, many replantings are going in using M.9 rootstocks, a fireblight sensitive understock. These two factors could lead to substantial losses as blight from susceptible cultivars gets into rootstock groundsuckers on all varieties threatening the entire orchard. We need continued research into the control of this bacterial disease including both chemical and cultural methods.

Firmer Apples for Consumers

Consumers are beginning to recognize that fruit quality is not all about size and colour. This has come about with a number of apple varieties that are not all large and 100% red, green or yellow. Orange and red striped varieties that are of moderate size have captured consumer taste buds. Produce shoppers now value freshness and flavour. And the crunch or firmness of the product best characterizes freshness. British buyers of Ontario Empire insist that fruit must arrive in Britain at defined firmness...i.e. 14 psi. For this to be achieved the fruit should leave Ontario at 16 psi. since there are seasons when 2 psi are lost in transit. There are other seasons when barely 0.5 psi are lost in transit. As we near the full potential for this market it is imperative that fruit last as long as the marketing season w.r.t. fruit firmness. Failing to meet the English market means late season Empire are sold in Ontario at reduced prices. The industry needs to examine all the factors that determine fruit firmness from orchard practices right through storage to transport to market. Can we control or change these factors and what impact does each have? Answers to these questions could greatly influence the quality of fruit shipped and the length of season we can continue to ship. A study of this nature could also benefit most other varieties here at home e.g. McIntosh.

Emerging Pest Problems

With the increased acreage of dwarfing rootstocks being planted in the province several pests are becoming a significant problem including dogwood borer and fireblight (rootstock phase). Another pest, the European apple sawfly has been moving steadily westward and is now present from Prince Edward county eastward. The Oriental fruit moth, resistant to OP insecticides in

most of the province is becoming a problem in apple orchards located near peach plantings, especially in Niagara and Essex-Kent.

Apple Nutrition For High Density Orchard on Dwarfing Rootstocks

With the move to more shallow rooted dwarf plantings of apple and the increased density of orchards, nutritional needs and reliable standards for helping to determine fertilizer usage rates and methods of application are not fully developed. Concerns include leaf analysis standards for some of the newer cultivars, the role of phosphorus in these new high density blocks, potential benefits of site specific farming (GPS) and the cost/benefit analysis for the use of a variety of proprietary foliar nutritional programs . The standard of leaf analysis by which fertility decisions have been largely based on for the last 25 years is now being challenged by proponents of fruitlet analysis aiming to correct problems (real or perceived) in the current year without the necessary calibration work to back up claims.

Reductions in OMAFRA Research and Extension

The cuts to OMAFRA field staff and the University of Guelph/OMAFRA Contract, announced on December 2th, 1999 will have a major negative impact on research and the delivery, maintenance, and further development of apple extension in Ontario. Growers committee members expressed grave concern that OMAFRA had no consultation with the agricultural community before or in how these reductions were to be effected.

The Committee recognizes that there is diminishing support for research, development and delivery and that there are less research and extension personnel to conduct and disseminate new research funding. The Committee also stated that new funding initiatives often support 'novel and new' research, leaving little or no support for on-going core industry problems. It was further stated that researchers are spending disproportionately more time raising research funding and less time actually conducting research.

One example where recent OMAFRA staff reductions will have an effect are the implementation of integrated pest management programs for apples. The loss of regional monitoring, agri-phones, local apple study groups, twilight meetings and other extension activities in apple growing areas will result in a reversion to more pesticide applications and decreased adoption of new IPM technologies. This will, in turn, result in significant increased economic costs and strong negative environmental impacts.

Funding for Research

Decreasing government support for agri-research in Ontario has made it necessary for grower groups such as the Ontario Apple Marketing Commission to fund research with their limited budget. Funding programs such as the Ontario Challenge Fund and CanAdapt have been established for such purposes. However, the OAMC, in particular has found access to this funding somewhat difficult. Some of the impediments are: 1) being aware of all the agencies supporting agri-research and the terms and objectives of funding; 2) having adequate in-house expertise to draft the comprehensive proposals that are often required; and 3) Programmes objectives are sometimes too loosely defined and do not always serve the best interest of the commodity. For examples, CanAdapt requires "*new and innovative*" projects. However, some of the predominate issues facing the apple industry are not new and will not be solved through new

and innovative technologies such as biotechnology.

BERRY CROPS

Food Safety and GMO's

Food safety continues to be an issue both for growers and consumers. OMAFRA extension staff must continue to educate growers on food safety issues and the practices needed to avoid potential problems. Particular concerns at this time are practical methods to test surface water for contamination and consumer concerns about Genetically Modified Organisms.

Pesticide Registration

The US and Canada are moving more and more to harmonization of pesticide registration with joint review now a possibility. However, many pesticides continue to be registered first in the US for a wide range of horticultural and other crops, and then in Canada, at a later date, for a smaller range of crops. Additional registrations must then be achieved through minor-use registration transferring the cost to Canadian taxpayers. Given that there is limited funding for URMULE/URMUR this restricts the availability of these pesticides for minor crops in Canada and puts us at a disadvantage compared to our US counterparts. This problem will be further compounded when labs producing pesticide registration data begin GLP increasing the cost and putting more stress on the minor use registration system.

Accessibility of Field Extension Services

When changes were made to the OMAFRA field extension services in 1995, many field staff were lost and territories expanded for the remaining staff. OMAFRA's mandate shifted from field service to program development. In some commodities, private industry has filled the gap left in the field. This has not been the case in the berry industry. Although the current extension staff try their best, it is often impossible for growers to reach extension staff at critical times of the year. Growers need the field experience that many OMAFRA personnel possess. Program development is important, but not at the expense of grower contact and regional programs.

This issue was raised by growers at the November 9th meeting. Changes to OMAFRA announced since that meeting have compounded the problem of accessibility to field services.

Shortage of Reliable Labour

A reliable supply of labour is a consistent issue in most berry growing areas. This problem is due, in part, to the change from PYO to ready picked requiring more labour than in the past. In addition, the season has shifted earlier so that high school students are not available until the latter part of harvest. There has also been a shift from agricultural summer jobs to the service

industry jobs in many areas. The lack of reliable harvest help is a major factor in limiting the size of berry plantings in Ontario.

Availability and Quality of Water for Irrigation

The past two years have been hotter and dryer than normal resulting in increased use of irrigation to maintain crop health and yields. This along with increased demand for water for other uses has resulted in increasing conflict between users. Adequate, good quality water is necessary to maintain berry crops in dry years. Not only is availability a concern, but consistent water quality is essential in light of food safety and consumer concerns.

Rapid Disease Diagnosis

Techniques for the rapid diagnosis of many crop diseases are becoming available. The OBGA is currently funding research in the develop of PCR-based diagnosis which should be available to the Pest Diagnostic Clinic within three years. It is important to the horticultural industry that the Pest Diagnostic Clinic be equipped and staffed to conduct PCR and other rapid diagnostic procedures in a timely and efficient manner.

Disposal of Plastic from Plasticulture

The use of plasticulture in berry production is small compared to other horticultural crops, however it is increasing and there is concern about the disposal of plastic products used in agriculture.

CRUCIFER CROPS

1. Concern was expressed about the increasing annual pressure from overwintering pests that traditionally have not overwintered in Ontario and southern Quebec, most notably the diamondback moth.
2. Heart maggot" of broccoli has become a real concern for several growers in the York/Durham region.
3. The increasing prevalence of seed corn maggot damage on Nappa cabbage was considered a potential future concern.

GINSENG

1. The costs associated with GLP will have a negative impact on research done for minor use registrations unless financial assistance is forthcoming.
2. The move to harvesting older root has led to a higher percentage of diseased culls. There is not yet a means available to control the fungus that causes these losses (Cylindrocarpon)
3. The use of Quintozene in Ontario ginseng is preventing the movement of root into expanding European markets and into the US. US production in Wisconsin will drop to

500,000 lbs. in 3 years and Ontario cannot fill the gap while the US has a 0 (zero) tolerance for this chemical on ginseng. The MRL needs to be established that reflects use patterns.

4. There is conflicting market intelligence from growers who visit China. Most growers are confused about the demand in China and the potential.
5. More clinical trials are necessary to take advantage of the North American and European markets.
6. The use of micronutrients without accompanying data to support rates has led to toxic responses in a number of gardens.
7. There is no easy method to identify Cylindrocarpon in ginseng. Growers who do not obtain professional diagnosis frequently mis-identify the symptoms and exacerbate the problem with the wrong treatment.

   a) Above ground stratification of ginseng seeds needs to be adopted by growers in an effort to overcome this disease.
8. Technology that can accurately identify Cylindrocarpon in plant tissue and in soil needs to be available to growers.There is an increasing incidence of "rusty root" in ginseng gardens. Growers use this term to refer to symptoms of disease but the failure to accurately diagnose the causal agent makes it difficult to combat the problem.
9. It is essential that growers have access to disease resistant varieties.

GRAPE AND WINE

1. Availability of pesticides and grape integrated pest management

The existence of materials registered in the US and not in Canada is a constant source of frustration to growers, particularly juice grape growers because their product must cross the border. Not only does it put Canadian grape growers at a disadvantage, it puts the IPM research at a disadvantage. Not having the use of the materials in field scale experimental programmes makes it difficult to see how they fit in with the existing materials. It also makes it difficult to plan for resistance management if these new materials are prone to forcing resistant populations.

Materials not registered in the US have a zero tolerance limit, but Canadian material has not been detained for residue infractions so far. The review by EPA/FQPA and PMRA of organophosphates, the juice manufacturer's imposed restriction on EBDC's only before bloom, the possible removal/restriction of carbamate insecticides only make these restrictions more onerous and residues faults may be inevitable.

The whole integrated pest management strategy for grapes needs to revisited. The materials available will always be in a state of flux, but the "fit" of the new ones in this general matrix must be determined. This means an ongoing review of IPM strategy and building into this strategy resistance management for powdery mildew and botrytis bunch rot control, taking into account new materials presently available in the US that may already be developing resistant populations.

The production systems for grapes are changing, such that many tons are left hanging for late harvest and ice wine production. These late harvests may confound late season powdery mildew control because of fermentation interference and other means of late season powdery mildew control may have to be addressed.

The growing problem of European red mite is being addressed by the introduction of predatory mites into the vineyards, but the "fit" of this system with the newer pesticides is not known and must be integrated carefully into the grape IPM programme. This holds true for other non-chemical methods of pest control such as pheromone disruption techniques.

2. Wine labelling

Although a federal issue, wine labelling is a sore point particularly in Ontario with a large domestic industry. The Wine Content Act allows for up to 75% imported product in a bottle labelled as 'Product of Canada'. If the National Wine Standards are adopted, these will then be labelled 'Cellared in Canada' by a winery with product of Country 'X'. This is a much more consumer friendly method of labelling and will be a welcome change from the deceptive 'Product of Canada'. The only guarantee of local product is a label with a VQA logo appended.

3. Bird damage

This is becoming an increasingly difficult problem to address. With more rural neighbours arriving from the city, the concept of the quiet, idyllic countryside is unrealistic. Also, with the increasing importance of late harvest and ice wine vintages, bird protection is necessary longer in the season, sometimes until early February. Although lawsuits have been limited, complaints are numerous and growing. Brock University has embarked on bird behaviour studies and the local agricultural engineer has begun a pro-active programme to try and defuse confrontations before they escalate to legal proportions. Growers are aware of the friction but other bird deterrent methods need to be investigated

Two chemical means being investigated at present - sucrose sprays and methyl anthranilate sprays (MA), are quite successful, but both represent compounds not compliant to the quality wine industry. Sucrose represents a sweetener being added to the fruit, in conflict to the VQA regulations, and MA is a compound derived from labrusca grape varieties. To be a successful deterrent, MA must be sprayed at a concentration such that its flavour can be detected by the consumer. And reminders of the historical connection with the labrusca wine industry is the last thing the present wine industry wants. It would destroy its hard won reputation today.

4. Niagara Area Weather Network - Although the Niagara Area Weather Network in safe and sound within the walls of Brock University, its maintenance and general daily operations must be guaranteed. Monitoring of data integrity and physical observation of the sites and equipment are duties yet to be defined. Continued subscription of the present consortium is also necessary for the maintenance of the equipment and archiving of files. Review of the original programming is also necessary so that individual subscribers can make better use of the data available.

5. Information transfer from publicly funded projects - There has always been controversy about access to information generated from publicly funded trials. Some granting agencies, notably IRAP/NSERC, allow co-operators to subscribe to the right of proprietary information. This makes the sharing of research results problematic and frustrating to those who technically shared in the cost of the work. Agricultural research has traditionally been generous in sharing results but it is difficult to argue with "direct owners" or even those whose costs are partially covered by an individual or firm. A system of posting results from these, otherwise privately conducted trials, must be devised to make the work more equitable and prevent duplication.

GREENHOUSE AND PROTECTED CROPS

A. Greenhouse Vegetables

1. *Labor* – The shortage of both manual and middle management labor was identified as the biggest issue. To address the need for manual labor, the assistance of the Ministries of Labor and Citizenship have been sought to relieve the chronic shortage of labor in the Leamington area. Regarding the need for middle management labor, the University of Windsor will (reportedly) be taking some initiatives. The Marketing Board has also hired a labor co-ordinator to address the issue of labor shortage.

2. *Energy use and use of waste heat.*

3. *Environmental friendliness of the industry* – i.e. recycling of plastics, disposal of plant debris, contamination of ground-water by run-off fertilizers from greenhouses.

4. *Availability of water for greenhouse use* – this is a concern of the entire province.

5. *Food Safety* – There is concern that this could become a trade issue in the future.

B. Mushrooms

Commercial mushrooms

The two main concerns are 1) environmental issues developing from urban encroachment and 2) shortage of farm labour.

Environmental issues developing from urban encroachment

The committee continues to be ambivalent about the effectiveness of Bill 146, "*Farming and Food Production Protection Act,*" to protect and promote the mushroom industry. This concern, currently in the form of composting odors, is highlighted by three recent situations - one in British Columbia and two in Ontario.

In British Columbia, mushroom composting regulation was put in place in November 1998, under the Waste Management Act. It states that "air contaminants from the mushroom composting facility must not be discharged in a manner that causes pollution". Pollution is defined as " the presence in the environment of substances or contaminants that alter or impair the usefulness of the environment". The regulation sets out specific requirements for building design and operation.

In Ontario, the Farm Practices Board, ruling on case during 1999, put the mushroom industry on notice saying that "conventional Phase I process is only marginally acceptable in 1999". The Board further stated "... in the future and as technology develops, the Board may arrive at a different conclusion in the future if presented with similar facts".

Also, in Ontario in 1999, a civil case was brought against a mushroom farmer for producing composting odors. The judge ruled in favor of the neighbors; the farmer is appealing. The court by-passed the Normal Farm Practices Board.

(Excerpts were taken from "Odor and Mushroom Composting" in Mushroom Newsletter 3(4):1-2, November 1999.)

Farm labor in short supply

Producers of mushrooms, generally, have depended on unskilled immigrant workers. Farms are losing labor to higher paying jobs and finding it increasingly difficult to fill positions. The impact will be an increase in labor costs, narrowing the profit margin.

Specialty Mushrooms

"Dumping" of shiitake mushrooms from China

Growers "claim" that China is exporting fresh shiitake mushrooms to Canada. Questions arise? Are the mushrooms being dumped? And what chemical(s) is being used to maintain freshness during shipment.

Farm labor in short supply

The concern is similar to that of the commercial mushrooms.

LOW ACREAGE & SPECIAL CROPS

1) Proprietary Research: In a climate of decreasing resources, and especially that of research science in the area of minor crops, it is disconcerting to know that all too often now research is being conducted on a proprietary basis. This has come about mainly by reduced governmental funding, and a need to access 'private industry' money to maintain research programs.

2) Good Lab Practices: All residue sample analysis for new pesticide registrations will need to be compliant with Good Lab Practices (GLP) –effective October 1st, 1999. If the University of Guelph and Agriculture Canada are not GLP compliant, the probability of getting the required registrations on a timely basis becomes more and more remote. There will have to be the

willingness and funding of the research community to adopt GLP, or be prepared to leave this process to what ever private industry might exist.

3) Price Look Up: Many large buyers in the fresh produce business are requiring Price Look Up (PLU) labeling before they will commit to buy from growers. This will amount to another expensive cost of production to the grower without there being any direct return to them. Many of the smaller growers will not be able to afford PLU labeling, and therefore, may be forced out of business accordingly.

4) Bee Poisoning: This past year saw more than normal amounts of bees being poisoned. Bee keepers find that placing hives into cucumber fields for purposes of pollination, also find that these fields are close to sweet corn fields. Bees will at times forage for sweet corn pollen and be accidentally/inadvertantly killed when sweet corn is being sprayed for European Corn Borer control. Bee keepers, cucumber growers and sweet corn producers have met twice already to try and find solutions to this problem. Pickling cucumber production has been on the rise lately with the commitment of Bick's Pickles to establish a tank-farm in the Norfolk area.

MUCK CROPS

1. Vegetable Leafminers (*Liriomyza sativae*)
2. Potential loss of Prowl , Goal herbicides for Onions

NURSERY/LANDSCAPE & TURFGRASS

Water quality/quantity

Because of another long, hot, dry summer experienced in 1999, and because of longer term concerns about water supply, use, and conservation, water was identified again as an emerging issue in the nursery, landscape and turf sector. Approaches to dealing with this issue are suggested in the research priority adopted by the subcommittee (Water Use and Management, below). There is increasing need for technology transfer to improve choice and proper use of irrigation equipment and proper irrigation scheduling.

New pests and changes in availability of control methods

There are emerging and long-standing pest problems in nursery, landscape and turfgrass industries which remain worrisome, or threaten to become problems because of lack or loss of chemical control methods, or limited understanding of the pests. Some examples are pine shoot beetle in nursery plants, and anthracnose basal rot and necrotic ring spot in turfgrass. Continued efforts both in research and in technology transfer will be important in facing this issue.

Nutrient management and organic waste use

In the context of water use/water quality concerns and the climate of reduction of pesticide inputs, an ongoing need was expressed for increased research into products like waste-based

fertilizers, wetting agents, bioactive agents such as humates, and other soil amendments. In both turf and nursery operations a need was expressed for continued research into optimizing systems to apply nutrients and micronutrients to a range of rootzones while minimizing leaching and runoff losses

POTATO

1. Water Management and Quality. Water availability, quality and management is a major issue in the province. Rapid urban and industrial development has left growers sharing water resources with hundreds of new communities and factories. This affects both the quality and quantity of water available.

2. Manure Management. For many years, manure has been widely used by vegetable growers to improve soil fertility. Recent research has indicated that manure applications reduce the incidence of scab, a serious problem of potatoes. Consumers concerns regarding the use of manure and human health need to be addressed.

3. Food Safety. Processors, packing plants or others in the chain of food production and distribution may soon request a record of production practices with every load of potatoes to address the food-safety concerns.

4. Consumers Acceptance of genetically modified (GM) Potatoes. Biotechnology has provided growers with varieties that are resistant to pests. However, agitation against GMOs in Europe has been intense enough to lead many international food companies to think it will be impossible to sell GM food there. These companies have similar concerns about the prospects for sales in North America

SWEET CORN

1. Food Quality Protection Act. While this is U.S. legislation aimed at reevaluating pesticide use and its impact on human health, there will be an impact on the availability of pesticides to Canadian growers or the ability of Canadian growers/processors to export food products to the U.S. which may have had certain pesticides applied to them. The sweet corn industry stands to loose some of its major insecticides as a result of this. While it may not be possible to prevent these losses, it is important to look for new alternatives.

2. Transgenic technology. Transgenic sweet corn could have a major impact on the sweet corn industry. Transgenic cultivars are a positive tool for growers, in terms of better insect control, area-wide suppression of corn borers, and more effective weed control. However, recent negative publicity has reduced the enthusiasm of growers and processors to use Bt sweet corn. Apparently a certification program is being developed for growers who want to grow non-GMO crops, which would include sweet corn.

3. Length of Time for Pesticide Registrations. Concern was expressed regarding the length of time needed to register new pesticides for sweet corn. This brought up the continued concern of imbalances between pesticides available to Ontario growers and those available to U.S. growers and the call for harmonization of pesticides within these two markets.

4. Disposal of Plastic Mulch. With the increased use of plastic mulches for early sweet corn, there is a concern about disposal in the future. Generally, landfills will still accept this material, but that may change. Recycling is not an option at the moment due to the dirt on the material.

5. Quality of Fresh Market Corn. Concern was expressed regarding Ontario fresh market growers maintaining quality on a consistent basis. There is still poor quality corn finding its way onto the market, especially early in the season, which hurts the entire industry.

6. Declining Research Funds and Personnel. Research funds are becoming harder to find, especially for commodity groups with no grower organization. Research and extension personnel are also in decline, which is a concern.

7. Computerized Field Equipment. Technology is helping growers manage their crops and be more efficient. The use of Global Position System and computerized yield monitors, for example, are providing useful information to growers.

8. Internet. News groups are becoming more common and are useful sources of information for growers and processors.

9. Bee Kills. Bee kills associated with insecticides being applied to sweet corn fields are increasing. 1999 was a particularly bad summer due to several factors related to the weather; dry conditions forced bees to collect pollen in sweet corn, which they usually do not do, and the use of insecticides which have residual activity in hot conditions which also are very toxic to bees. The Ontario Beekeepers Association made several recommendations, which included promoting IPM in sweet corn, the development of bee deterrent chemicals, and compensation to beekeepers by offending parties.

10. Change in Pest Complex. With the milder winters and warm, dry summers we have experienced over the past 2 season, pest problems are changing. Stewarts wilt, which has not been a concern in Ontario in the past, caused major damage in some locations in 1999. Similarly, rust and smut have been reported to be more of a problem recently.

TENDER FRUIT

1. Census - resolved by OMAFRA - complete by March 1, 2000
2. Shortfall in processing supply - require increased production/expansion of industry
3. Continue 'HRIO' breeding programs at Vineland
   - staffing: vice Miles (retiring at the end of 1999), also vice Tehrani
   - justification for staffing in preparation by U. of Guelph, Dept Plant Agriculture
   - industry to recommend that position is located at Vineland, primary emphasis on research with service (extension) component. Not to be a teaching position at Guelph.
4. Plum pox virus - National task force established to advise CFIA re prevention of this

disease spreading into Canada

5. Food safety - efforts to ensure food safety co-ordinated with industry practices and industry to be involved in establishing code of horticultural practices
6. Noise concerns - more legal rights to growers, but still get complaints
7. Nutrient management plan – need to know how this impacts the tender fruit industry
8. Shrinking tender fruit land base – need to expand to new areas

TOMATOES

1. Climatic changes are a growing concern for this and other commodities. Changes in weather patterns need to be considered when reviewing water conservation and other management practices. Also, drip irrigation on processing tomatoes is being used more frequently by Ontario growers, and more information is required on the proper use of this management practice.

2. Good laboratory practices/Good field practices. Minor Use Registrations under new PMRA regulations (GLP/GFP) will require site certification and increased costs for residue trials and analyses. It is recommended that increased funding be made available to the minor use registration program and site certification be established at public institutions within Ontario.

TECHNOLOGY ADOPTION

The minor use registration of Prism was completed to allow growers to use this product for post emergence control of hairy nightshade in processing tomatoes.

REPORT OF ACTION TAKEN ON PREVIOUS RECOMMENDATIONS

I SAMPLE LETTER FOR RESPONSE TO RECOMMENDATIONS

Letters to the appropriate person/agency requesting a written response to the research and services recommendations of the various OHCRSC sub-committees.

II Date of response.

III Responses and Actions Taken on the Previous Years' Sub-Committee's Recommendations.

Responses include the OHCRSC executive committee's responses, published in last year's Annual Report and distributed to the sub-committee chairs by January 18, 1999, responses by those individuals who were asked to comment on the specific recommendations as indicated in the sample letter (I), and actions taken by the sub-committees themselves.

SAMPLE LETTER FOR RESPONSE TO RECOMMENDATIONS

The following letter was addressed to the various individuals/agencies requesting their responses in a timely manner. On the following page is a list of individuals who were asked to respond indicating if and when they responded to the OHCRSC.

January 18, 1999

Dear _____

The Ontario Horticulture Crops Research and Services Committee has reviewed the 32 research and services recommendations brought forward by the various commodity sub-committees. As chair, I have been asked to distribute the recommendations which require responses from the appropriate individuals.

I would like to forward your reply to the appropriate subcommittee chair by the first week in March.

I have indicated the subcommittee making the recommendation, the address of its chair, the recommendation number and title, a brief outline of the issue involved, the response by the OHCRSC main committee, leaving a space for your response.

I appreciate your efforts in addressing the concerns of the many individuals whom have helped develop these recommendations .

SUB-COMMITTEE

Name and address of chair

Sincerely

Dr. Ron Pitblado
Chair, Ontario Horticultural Crops Research and Services Committee (OHCRSC)
Ridgetown College, University of Guelph

DATE OF RESPONSE

AGENCY	CONTACT PERSON	DATE OF RESPONSE 1999
Director, AAFC London	Dr. Frank Marks	February 17
Dept. of Food Science University of Guelph	Dr. Marvin Tung	February 17
Director, Agri-Food System Resources & Environment Research Program, OMAFRA	Dr. Michael Goss	May 14
Dept. Land Resource Science University of Guelph	Dr. Richard Protz	December 6
Dept. of Plant Science University of Guelph	Dr. Clarence Swanton	No Reply
ADM Ag & Rural Division OMAFRA, Guelph	Jim Wheeler	No Reply
Foods Program Co-ordinator OMAFRA, Guelph	Dr. Marc LeMaguer	No Reply
Environmental Management Specialist - Water Management 1 Stone Road, Guelph	Peter Roberts	No Reply
Guelph Turfgrass Institute University of Guelph	Rob Witherspoon	No Reply
Program Manager Animal Health, Ontario Area Canadian Food Inspection Agency	Dr. Jim Clark	No Reply

RESPONSES AND ACTION TAKEN TO THE PREVIOUS YEARS' SUB-COMMITTEE'S RECOMMENDATIONS

AGROFORESTRY

Recommendation 1
Food processing issues for Maple products.

Response
The same 4 food processing recommendations were forwarded last year to the University of Guelph Food Research Program Co-ordinator Dr. Marc LeMaguer. The chair of the OHCRSC will again forward these recommendations and remind Dr. LeMaguer the importance of his response. The chair will also forward these recommendations to the Ontario Food Processing Research and Services Committee. These recommendations were not sent to this committee last year due to the inactivity of that committee. It has been suggested that the OFPRSC is back running again.

Letter sent to Dr. Marc LeMaguer: No Response

Letter sent to Dr. Marvin Tung: Response dated February 17, 1999

In the Food Science Department at Guelph, a number of researchers are experienced in basic and applied studies on currently-known food-grade polymers which may have potential for use as stabilizing ingredients in aqueous solutions of sugar (part iv), and more complex dispersions such as maple butter and ice cream (parts i and ii). As well, the Guelph Food Technology Centre is well-positioned to carry out product and process development contract work for the maple food industry.

Cc. Todd leuty, Chair, Agroforestry Subcommittee
Food Science Faculty Distribution List
Terry Maurice, President, Guelph Food Technology Centre
Carolyn Moore, OFPRSC, OMAFRA

Sub-Committee's Actions

1. *Ice cream and syrup separation – contacted Beatrice Foods in Scarborough, the new owners of the ice cream facility where the problem occurs. Discussed with the Quality Assurance Manager, their foods-lab will make corrections. – T. Leuty*
2. *Natural stabilizer for maple butter – discussed the syrup separation issue in maple butter with several maple producers who make maple butter. Separation is a result of improper*

ingredient temperatures during processing and can be remedied by following quality procedures. This has been directed to Shirely Hazlett, Maple Seal of Quality Director.

3. *Syrup layering – University of Vermont's syrup processing specialist, Dr. Sumner Williams, looked into the layering problem. It is only a problem in glass containers (can be seen). He didn't know how to prevent this since any additive would disallow the word 'Pure' on the label. He believes layering is a natural characteristic of pure maple syrup. Agitate filled glass containers just before marketing. – T. Leuty*
4. *Any additional problems, maple producers have been steered to Dr. Myers of the Guelph Food Technology center for further assistance. – T. Leuty*

Recommendation 2

Sequestering atmospheric carbon dioxide - Reducing nutrient loading.

Response

Referred to Dr. Michael Goss, the University of Guelph Agri-Food Resource and Environment Research Program Co-ordinator.

Letter sent to Dr. Michael Goss: Response dated May 14, 1999

Greenhouse gas emissions and carbon sequestration is one of the issues identified in the new Agri-Food Resources & Environment Program.

The Program will take account of the priorities from all the OASCC committees in selecting projects that can be funded with the finite resources available

cc. Todd Leuty, Chair, Agroforestry Subcommittee

Sub-Committee's Actions

- discussed with John Kort, Shelterbelt Biologist, Agriculture Canada's Prairie Farm Rehabilitation Center, Saskatchewan. They are trying to determine quantity of carbon tied up by shelterbelts and windbreaks. It would be useful to know the quantity of carbon per acre (ha) of shelterbelt and most efficient species to plant. If each farm had 3 to 5 acres devoted to field shelters (thicker than a single row of windbreak) or treed farm building shelters, an incentive to farmers to establish these may be a significant contribution for Ontario's / Canada's carbon sequestering activities. – T. Leuty.

Recommendation 3

Riparian buffer management.

Response

Referred to Dr. Michael Goss, the University of Guelph Agri-Food Resource and Environment Research Program Co-ordinator.

Letter sent to Dr. Michael Goss: Response dated May 14, 1999
Riparian and Wetland Management is one of the issues identified in the new Agri-Food Resources & Environment Program. Good progress on this issue was made over the three years of activity in the Environment and Natural Resources Program.
The Program will take account of the priorities from all the OASCC committees in selecting projects that can be funded with the finite resources avaialble.
cc. Todd Leuty, Chair, Agroforestry Subcommittee

Sub-Committee's Actions
With funding acquired, Conservation Authorities partnered with the OSCIA and began joint studies on existing watercourse buffers on active farmland. OSCIA will gain by learning water quality enhancement to assist farmers while Conservation Authorities gain scientific knowledge on stream biology, preferred plant species to establish along farm and rural streams and how farming affects water dynamics. Andy Graham, OSCIA and Martin Neumann, Grand River Conservation Authority.

Recommendation 4
Pasture tree shelters to improve herd productivity.

Response
The Agroforestry Sub-committee is asked to refer to last years response to their identical recommendation (see Recommendation 14 - 1997) from Dr. Roger Hacker, U. of G. Animals Program Co-ordinator.

Recommendation 5
Intercropping: evaluation of interactions.

Response
This priority item (vs a recommendation) is being addressed.

Sub-Committee's Actions
Please see new OMAFRA Factsheet entitled 'Intercropping trees and annual crops' to gain an understanding of how intercropping, in economic terms of food-bearing trees, has been applied to Ontario farmland. See OMAFRA's Agroforestry web-site.

Recommendation 6
Food storage technology for Persian and Carpathian walnuts and sweet chestnuts.

Response
The Agroforestry Sub-committee has indicated that the nut producers are developing a system of storing Persian and Carpathian walnuts on their own. They would benefit from additional

assistance by food storage researchers at the Vineland Station Storage research facility or by the storage expertise at the University of Guelph. The executive committee of the OHCRSC is anxiously awaiting hearing who amongst the Agroforestry Sub-committee has contacted at either Vineland and/or Guelph to pursue this priority item.
Letter sent to Dr. Clarence Swanton: No Response

Sub-Committee's Actions
Information pertaining to nut storage has been accessed for Ontario nut producers on best storage temperatures, humidity, cleanliness and packaging of product. University of California's Horticultural Research Department can provide details. Ernie Grimo, SONG

Recommendation 7
Extraction of marketable edible oils from walnut cultivars.

Response
The Agroforestry Sub-committee are advised to contact Dr. Mark LeMaguer, Research Co-ordinator of the Foods Program at the U. of G. and develop a plan with the appropriate private industry partners.

Letter sent to Dr. Marc LeMaguer: No Response

Sub-Committee's Actions
An extraction technique is described in the California walnut producer's web-site for small scale and large-scale businesses. Ontario producers have access to this information. – T. Leuty

Recommendation 8
Cultural management studies for nut tree orchards.

Response
This priority item (not a recommendation) is being addressed at HRIO Simcoe. The Agroforestry Sub-committee needs to review the response to this same recommendation last year (Recommendation 8), containing comments from Ralph Goodale, Minister of Agriculture.

Letter sent to Dr. Clarence Swanton: No Response

Sub-Committee's Actions
The members of SONG express appreciation for the ongoing work being done at HES Simcoe. Evaluations were provided to SONG at winter meetings.

APICULTURE & POLLINATION

The OHCRSC recognizes the list of priorities and unnecessarily re-listed them as recommendations.

Priority
To support the continued ban on the importation of honey bees to Canada from mainland United States, passed Dec. 1997.

Letter sent by Ken Marchant, Area Program Officer - Plant Protection Ontario to Dr. Jim Clark, Program Manager, Animal Health, Ontario Area, Canadian Food Inspection Agency - Plant Protection Program, Guelph: No Response
cc. Blake Ferguson
Dr. Ron Pitblado

Sub-Committee's Actions
The 1999 recommendations were directed to the appropriate agencies.

APPLES

Recommendation 1
GENETIC TRANSFORMATION OF APPLE: We would encourage AAFC, Vineland to interact and cooperate in joint research projects in the area of genetic transformation of fruit crops as it pertains to apple to share in the exchange of germplasm and information where possible. Apart from developing an apple breeding program in Ontario (which is not what this committee is recommending), this will enable Ontario growers the access to information and hopefully material once genetically transformed fruit are available for commercial planting.

Response
The OHCRSC acknowledges the Apple Sub-committees suggestion to expand the fireblight transformation research project to apples and will forward the committees request to Dr. Dave Hunter at AAFC in Vineland. The speed of this program must be tempered however knowing that Monsanto, owner of this technology may require licence fees or other cost recovery mechanisms and that government programs must proceed with caution.

Sub-Committee's Actions
No action was taken on our 1998 recommendations. The report listed on the OMAFRA website is our 1997 report and we received no verbal or written report of action taken on our 1998 Apple Research and Services Subcommittee recommendations.

The response to the Apple Sub-committee was forwarded to the chair in January 1999. Discussions should be ongoing with Dr. Dave Hunter at AAFC in Vineland who is a member of

the Apple Sub-committee.

BERRY CROPS

Recommendation 1
We recommend that horticultural crops be represented by its own OASCC sub-committee and that re-structuring to combine field crops with horticultural crops into one of seven OASCC sub-committees not occur.

Response
It is understood by the OHCRSC that the decision of combining the Field Crops, Pest Management and Horticultural Crops Research and Services committees has already been made and that we are being asked to devise a system where each of the initiatives of these three groups can be enhanced through a new structure. The OHCRSC has put forth two suggested structures to be considered - see ISSUE # 1, page 144.

CRUCIFER CROPS

Recommendation 1
In light of the departure of Dr. Richard Parry as OMAFRA Horticultural Crop Advisor and his past service to the cole crop and rutabaga industry, the Ontario Crucifer Crops Committee requests that OMAFRA replace the position in time for the 1999 growing season.

Response
The OHCRSC recommends that the advisory services to the cole crop and rutabaga industry be provided and referred this recommendation to Jim Wheeler, ADM, Ag & Rural Division.

Letter sent to Jim Wheeler: No Response

GINSENG

The OHCRSC acknowledges the list of research and service priorities developed by this sub-committee. There were no additional recommendations as their key priorities are being addressed with available resources.

GRAPE & WINE

Recommendation 1
The Niagara Weather Network

Response

The Grape and Wine Research and Services Sub-committee submitted this recommendation as last year and indicated they are prepared to address this recommendation themselves with existing resources.

Sub-Committee's Actions

The consortium created in December 1998 has maintained the administration of the Niagara Area Weather Network and the central computers have been moved to Brock University. Sandra Yee has been contracted to maintain data management and oversee public inquiries and develop research priorities. Through the initiative of the Ontario Grape Growers Marketing Board, the consortium applied for and received a Rural Job Strategies grant that will allow for the installation of three more stations and maintain the present ones at the status quo. Negotiations are underway with Niagara College for the placement of the first of the new stations at the site of their new research vineyard to the south of the new college campus at Taylor Road.

Recommendation 2

The Grape and Wine Industry Web Page.

Response

The Grape and Wine Research and Services Sub-committee submitted this recommendation as last year and indicated they are prepared to address this recommendation themselves with existing resources.

Sub-Committee's Actions

This issue has taken care of itself with the development of a much expanded OMAFRA web page, a larger UG web page and the introduction of much more commercial traffic to the web. The challenge now is to maintain the currency and the integrity of the articles. There is still a logistical problem of renewing and adding to the various web pages, depending on the hierarchy of access, but that will resolve itself with time. Many fact sheets and short articles can now be easily published in this medium and will reach a greater number of people faster than ever before.

GREENHOUSE AND PROTECTED CROPS

The OHCRSC acknowledges the list of research and service priorities developed by this sub-committee. There were no additional recommendations as their key priorities are being addressed with available resources.

GREENHOUSE FLORICULTURE

Recommendation 1

To insure the long term viability of the Ontario greenhouse Floriculture industry, it is recommended that the reinvestment of financial resources into personnel by Agriculture and

Agri-Food Canada, University of Guelph and OMAFRA is essential if innovative research addressing production and pest management issues and effective "one-on-one" grower technology transfer is to continue. The industry has identified the following key positions:

1. The need is strong for a renewed commitment by AAFC to fund an ongoing Floriculture pest management programme consisting of at least two permanent positions, an entomologist and pathologist to address pest concerns on an ongoing basis and to supervise specific determinate industry funded projects;

2. The need exists for the University of Guelph to fill the faculty position in production floriculture vacant since the retirement of Dr. M.J. Tsujita because of the wide range of crops, production systems and to integrate the physiology-based basic research with the production perspective;

3. OMAFRA continue the same level of support to greenhouse floriculture technology transfer by filling the Greenhouse Floriculture specialist position located at the University of Guelph now vacant with the recent retirement of John Hughes.

The industry looks forward to meaningful discussions on potential options that industry, government and the University could consider to achieve these goals.

Response

A coordinated effort needs to be made between the industry and the three public agencies. The OHCRSC will refer this recommendation to the University of Guelph, Plant Agriculture, Dr. Clarence Swanton, AAFC Vineland, Dr. Frank Marks, and OMAFRA, Jim Wheeler.

Letter sent to Jim Wheeler: No Response

Letter sent to Dr. Clarence Swanton: No Response

Letter sent to Dr. Frank Marks: Response dated February 17, 1999

SCPFRC Vineland continues to provide plant protection reseach support through A-Base resources and joint industry - AAFC funding via the Matching Investment Initiative (MII). As well AAFC is supporting floriculture research via the CanAdapt Program administered by the Agricultural Adaptation Council.

At the present time, SCPFRC Vineland has a full time pathologist, Dr. Wayne Allen, and his support staff dedicated to floricultural research. It is our intention to refill a pest management position in floriculture when Dr. Allen retires in the next few years.

I agree fully with the response by the OHCRSC that a coordinated effort between industry, U. of Guelph, OMAFRA and AAFC is required to make the best use of the available funding to respond to the research and technology transfer needs of the industry. On behalf of SCPFRC, Drs. Allen and Tomlin participated in several consultation sessions with the stakeholders during the past year. We encourage the floriculture industry to establish research priorities and continue discussions with the agencies towards the effective utilization of resources to meet the industry immediate and long term research needs.

cc. Dr. Wayne Allen, SCPFRC Vineland

LOW ACREAGE & SPECIAL CROPS

Recommendation 1
That industry support and research programs continue and that cost-shared financial assistance continue to support the efforts of agri-business entrepreneurs to offset the development costs of production, value-added processing and marketing of low acreage and specialty crops.

Response
The OHCRSC recognizes the value and impact of the Tobacco Diversification Program in its support of cost-sharing with agri-business. There are however very few programs that allow equipment expenses to be shared to any great extent. Other research funding agencies the sub-committee may wish to investigate are IRAP, and the Rural Job Strategy Program.

Recommendation 2
Agriculture Canada to do more in the distribution of research results.

Response
AAFC has attempted to provide research information in may ways including factsheets, web pages - see Bruce Bowman's AAFA London web page as an example, brochures - PMN Pest Management News, and through field days. The AAFC representatives on the OHCRSC indicated they would take the message back with them and "try to do a better job at communications". Addressing one of the issues of researchers not wishing to release interim research results will continue to occur. Researchers need time to prove their hypothesis before releasing their information - there is too much of this early release of misinformation that is difficult to correct once released.

Recommendation 3
Too much paper work in the funding applications.

Response
Researchers are now forced to search out funding agencies which have different application and reporting systems requiring considerable time and effort to acquire resources. The OHCRSC has no solution but to remind applicants, "Those that have the gold have the power".

Recommendation 5
Need for fertility work on herbs and medicinals

Response
Referred to Dr. Michael Goss, the University of Guelph Agri-Food Resource and Environment Research Program Co-ordinator.

Letter sent to Dr. Michael Goss: Response dated May 14, 1999

Fertility research for crop production is part of the mandate of the Plants Program directed by Dave Hume. That Program will take account of the priorities from al the OASCC committees in selecting projects that can be funded with the finite resources available.
cc. Jody Bodnar, Chair, Low Acreage and Special Crops Subcommittee

Recommendation 6
That research variety trials for expanding crops such as garlic, sweet potatoes, sugar beets, melons and ethnic vegetables be initiated and/or expanded.

Response
The OHCRSC supports the continued effort towards expanding new crops for Ontario growers. The sub-committee is referred to the new "Special Crops Research Program" which may provide support for alternate crops technology.

Letter sent to Dr. Clarence Swanton: No Response

MUCK CROPS

Recommendation 1
Improvements in fertilizer recommendations for muck crops with emphasis on in-field evaluation of new micronutrient formulations and the use of foliar testing data. Macronutrient studies for selected crops are also needed.

Response
The OHCRSC encourages industry support to conduct in-field evaluation of micronutrients.

Letter sent to Dr. Michael Goss: Response dated May 14, 1999

I support the response from OHCRSC. Fertility research for crop production is part of the mandate of the Plants Program directed by Dave Hume. That Program will take account of the priorities from al the OASCC committees in selecting projects that can be funded with the finite resources available.
cc. Dr. Mary Ruth McDonald, Chair, Muck Crops Subcommittee

Recommendation 2
Continue cultivar evaluations for muck vegetables, with emphasis on processing carrots and all varieties of lettuce.

Response

The OHCRSC encourages industry support to conduct cultivar evaluations for muck crops.

Letter sent to Dr. Clarence Swanton: No Response

Recommendation 3

MAINTAIN EXTENSION SUPPORT FOR MUCK CROPS

Extension support for muck vegetable growers must be maintained in both the Bradford Marsh and Thedford Grand Bend Marsh areas. Recently, Richard Parry, the Hort Crops Advisor for the Thedford Grand Bend area submitted his resignation. It is not known when (or even if) his position will be filled. Other hort crops advisors will be taking over some of his duties, but this means that their efforts will be spread over a greater area. In the Bradford Marsh area, the extension duties of Mary Ruth McDonald (previously 25%) will be changed as a result of the merger with the University of Guelph. In both of these situations it is imperative to the industry that the extension services be maintained.

Response

The OHCRSC recommends that the advisory services to muck crop industry be provided and referred this recommendation to Jim Wheeler, ADM, Ag & Rural Division. The University of Guelph reassured the sub-committed that Mary Ruth McDonald continues to provide extension activities to a level of 8%.

Letter sent to Jim Wheeler: No Response

Recommendation 5

STREAMLINING FUNDING APPLICATIONS AND REPORTING

Paper work requirements for research grant applications and subsequent reporting to the granting agencies is becoming increasingly onerous. While it is understood that scientists and faculty are expected to be "research managers", excessive paper work of this kind is not the most effective use of the researcher's time. There has been considerable use of the OASCC system by other groups to make sure research is responsive to industry priorities. It is requested that the various granting agencies work toward a similar application and reporting format, which will include all the information needed for proper accounting but will be time-effective to fill out.

Response

Researchers are now forced to search out funding agencies which have different application and reporting systems requiring considerable time and effort to acquire resources. The OHCRSC has no solution but to remind applicants, "Those that have the gold have the power".

NURSERY/LANDSCAPE & TURFGRASS

Recommendation 1

TURFGRASS MANAGEMENT RESEARCH

The subcommittee on Nursery, Landscape and Turf recommends that the turfgrass management research program at the Guelph Turfgrass Institute and the University of Guelph continue to be maintained as a high priority by filling the vacant faculty position in turf management as soon as practicable. (In making this recommendation, we understand that this position has already been identified as a priority by the Department of Plant Agriculture.)

Response

The OHCRSC was informed that the Director of the Guelph Turfgrass Institute has already publically announced the selection process will begin in 1999.

Letter sent to Rob Witherspoon: No Response

Recommendation 2

IMPROVED ACCESS TO RESEARCH INFORMATION

The subcommittee on Nursery, Landscape and Turf recommends that priority be given to using the most up-to-date approaches and technologies, including (for example) Internet systems, to deliver research information and interpretation in support of industry.

Response

The OHCRSC applauds the Nursery/Landscape & Turfgrass sub-committee for their attempt to organize and deliver up-to-date research information to the industry. This will take financial commitments from the industry and a group of individuals prepared to deliver on this priority. The OHCRSC would like to hear from this group listing their activities and the lead individual(s) organizing this process.

Recommendation 3

WATER USE AND MANAGEMENT

The subcommittee on Nursery, Landscape and Turf recommends continued support for research into water use and water management in turf and nursery/landscape production.

Response

The OHCRSC concurs with this committee and will refer this recommendation to Michael Goss, U. of G. co-ordinator of the Agri-Food Resources and Environment Program and Peter Roberts, OMAFRA Environmental Management Specialist - Water Management who sits on behalf of OMAFRA on many of the water committees to report on their activities.

Letter sent to Peter Roberts: No Response

Letter sent to Dr. Michael Goss: Response dated May 14, 1999

Nitrogen-use efficiency is one of the issues identified in the new Agri-Food Resources &

Environment Program. Good progress on this issue was made over the three years of activity in the Environment and Natural Resources Program. A specific project addressed the problems of water and air quality associated with turfgrass production.
cc. Hugh Pearson, Chair, Nursery, Landscape and Turf Subcommittee

Recommendation 4
NUTRIENT MANAGEMENT AND RUNOFF
The subcommittee on Nursery, Landscape and Turf recommends continued support for research into nutrient management in turf and nursery/landscape production.

Response
The OHCRSC recognizes this research is ongoing and supports this priority item.

Letter sent to Dr. Michael Goss: Response dated May 14, 1999

Nitrogen-use efficiency is one of the issues identified in the new Agri-Food Resources & Environment Program. Good progress on this issue was made over the three years of activity in the Environment and Natural Resources Program. A specific project addressed the problems of water and air quality associated with turfgrass production. The new Agri-Food Resources & Environment Program will take account of the priorities from all the OASCC committees in selecting projects that can be funded with the finite resources available.
cc. Hugh Pearson, Chair, Nursery, Landscape and Turf Subcommittee

Recommendation 5
ACCREDITATION OF LABS FOR TISSUE ANALYSES
The subcommittee on Nursery, Landscape and Turf recommends that a system of accreditation of laboratories for tissue analyses for nutrients and micronutrients be put into place (similar to the accreditation system for soils analysis labs).

Response
Referred to ADM, Ag & Rural Division, Jim Wheeler.

Letter sent to Jim Wheeler: No Response

Sub-Committee's Actions
The Nursery, Landscape and Turf subcommittee acknowledges the support of the OHCRSC parent committee with respect to last year's recommendations.

Responses to last year's recommendations were discussed at the fall meeting. The positive response from the parent committee to the recommendation for improved access to research

information for the industry was gratifying. There is not yet an industry wide process in place, though there are some efforts (such as Landscape Ontario's website and the Guelph Turfgrass Institute website) to make use of the new technologies. The GTI Advisor (biweekly turf newsletter) will be moving to a free WWW/email based format in 2000.

The progress on filling the turfgrass management position at the University of Guelph is also gratifying. Because of the climate of cutbacks, we have retained this recommendation again this year to emphasize its importance to the turfgrass industry.

Research programs continued to address industry needs as evidenced by the continuation of projects and the initiation of new research efforts designed to meet stated concerns. The support of service personnel in extension and lab areas is also appreciated and continues to meet industry expectations.

POTATO

Recommendation 1

The ORPC recommends that the quality and availability of long term water supply be examined and that appropriate action taken to ensure a steady, safe supply of ground water for agricultural use.

Response

The OHCRSC recognizes that efforts dealing with water quality and availability is a multi disciplinary issue. The chair has been asked to contact Peter Roberts, OMAFRA Environmental Management Specialist - Water Management who sits on behalf of OMAFRA on many of the water committees to report on their activities.

Letter sent to Peter Roberts: No Response

Sub-Committee's Actions

At our winter meeting in February 1999, Paul Brine (OMAFRA, ERLD) informed the Committee that the OHCRSC has put this issue forward as a recommendation as has the Soil, Water and Air Research and Services Committee.

SWEET CORN

The OHCRSC acknowledges the list of research and service priorities developed by this sub-committee. There were no additional recommendations as their key priorities are being addressed with available resources.

TENDER FRUIT

Recommendation 1

Site Suitability for Tender Fruit Expansion

That the Department of Land, Resource and Science, University of Guelph take immediate action to evaluate site suitability (climate, soil, topography, etc.) for the expansion of tender fruit production outside of the traditional Niagara area.

Response

The chair has been asked to contact the Land Resource and Science faculty member Dr. Richard Protz to determine whether he can play a role or suggest others who can address this recommendation.

Letter sent to Dr. Richard Protz: No Response

The Chair of the OHCRSC, on prompting by Karl Evans, Field Superintendent, Nabisco Ltd, tried to contact Dr. Protz on December 6. Dr. Protz had officially retired in September but his research associate, Dr. Chris Duke indicated a willingness to discuss this issue with the appropriate representatives of the Tender Fruit Research and Services Sub-Committee. A letter was sent to Mr. Evans on December 7, 1999, informing him of this action, copied to the Tender Fruit chair, Ken Slingerland.

TOMATOES

Recommendation 1

Support of two vacant positions

The term Vegetable Production Specialist position at the Greenhouse and Processing Crops Research Centre is very important to the tomato industry, and this position should be filled on an indeterminate basis once the term has expired.

The vacant Vegetable Crops IPM Specialist position at Ridgetown is also very important to the tomato industry, and should be filled as soon as possible.

Response

The Vegetable Production Specialist position at the Greenhouse and Processing Crops Research Centre in Harrow is currently filled, with the individual being asked to develop a supportable program with the industry.

The vacant OMAFRA Vegetable Crops IPM Specialist position located at Ridgetown is presently under review. A method of continuing to offer the TOM-CAST service to growers in this region will be developed. The recommendation will be referred to ADM, Ag & Rural Division, Jim Wheeler.

Letter sent to Jim Wheeler: No Response

Recommendation 2

The tomato industry continues to stress the need for more resources in tomato breeding, particularly germplasm enhancement.

Response

The Tomato Sub-committee is referred to the responses provided last year by the Directors of Ridgetown College and GPCRC in Harrow. Expanded activity will require additional resources from the industry.

STRATEGIC DIRECTIONS/PROBLEMS OR ISSUES
SECTOR PRIORITIES

AGROFORESTRY

1. Sequestering atmospheric carbon dioxide – Reduced nutrient loading. Agroforestry-related land-use practices (intercropping and silvipasture) have potential to 1) sequester atmospheric carbon dioxide in both the soil and tree component of the system, and 2) reduce nutrient loading to adjacent waterways through the development of efficient nutrient cycling systems. – A.M. Gordon and N. Thevathasan, University of Guelph.

2. Extend ice storm recovery research projects in eastern Ontario for three additional years for optimum study results. Dave Chapeskie, OMAFRA.

3. Continue to support research of commercial nut culture and cultivar evaluations for managed orchards for the commercial nut industry at H.E.S. Simcoe. OMAFRA.

4. Using existing applied technology, investigate the rural economic potential of harvestable timberbelts as 'working' farm trees, placed around the outer perimeters of productive farm fields, focusing primarily on the heavily deforested yet highly sensitive wildlife corridor which extends north and south through all of Essex and Kent counties. Todd Leuty, OMAFRA and possibly Ken Elliot, Carolinian Forestry Specialist, OMNR, London and the area MNR Stewardship Coordinators.

5. Riparian buffer management – Continue to support joint studies between the OSCIA and the Grand River Conservation Authority's investigations of farm stream buffers and the effect of agriculture on water quality. Andy Graham, OSCIA and the Grand River Conservation Authority.

6. Support continuation of cleaning and sanitation of maple sap tubing research. Dave Chapeskie, OMAFRA.

7. To enable continued expansion of commercial (profitable) nut production in Ontario, pursue registration of the following three listed pest control products (Todd Leuty, Bernie Solymar, John Gardner) in the following order of priority:

Trade Name	Chemical Name	Crop / Pest	Manufacturer
Superior Oil	**Mineral Oil**	**All edible nuts:** Over-wintering scale, spider mites and aphids.	Bartlett Inc.
Imidan	**Phosmet**	**All edible nuts:** Codling moth, husk maggot, plum curculio, caterpillars.	Gowan Co.
Sevin XLR Plus (in progress)	**Carbaryl**	**Sweet Chestnut** Leafhopper	Rhone Poulenc

8. Support URMULE registration of the Herbicide 'Stinger' for use in the Christmas tree industry, weed management program – Dave Chapeskie, OMAFRA.

9. Support continuation of the newly established Maple Production Agriphone service to assist Ontario maple producers with production recommendations. Todd Leuty, OMAFRA.

10. Investigate adaptation of laser and GIS technology to sap line layout and forest inventory in commercial sugar bushes – Dave Chapeskie., OMAFRA

11. Investigate safety aspects in the use of efficient steam boilers for maple sap to syrup processing – Dave Chapeskie and Todd Leuty, OMAFRA

12. Maintain support of the sweet-tree sugar maple cloning trial – Todd Leuty and Dave Chapeskie.

13. To enable continued expansion of commercial nut production in Ontario, pursue registration of the following four pest control products (Todd Leuty, Bernie Solymar and John Gardner, OMAFRA) which are considered important but a lower priority than those products listed in Priority # 7 above:

Dipel	**Bacillus thuringiensis**	**All edible nuts:** Caterpillar pests	Abbott Labs
Sevin XLR Plus	**Carbaryl**	**Sweet Chestnut** Chestnut weevil	Rhone Poulenc
Thiodan	**Endosulfan**	**Walnut, butternut** Eurenium mite	AgrEvo
Thiodan	**Endosulfan**	**Hazelnuts** Bud mite	AgrEvo

APICULTURE & POLLINATION

I. Assessment of the Small Hive Beetle damage, development of management techniques and dissemination of developed information to beekeepers: An important new direction has been added to the beekeeping industry priority list. The Small Hive Beetle, *Athina tumida,* has invaded bee colonies in Florida and several other states in the US including NY and Michigan. This beetle has killed more than 30,000 colonies in the US and has become a serious pest in bee colonies and honey houses. Beekeepers in the US have section 18 to use Coumaphos strips (new formulation) to control the Small Hive Beetle. The concern of beekeepers in Ontario is that some of the infected bee colonies are across the border within bee flying distance. In addition, Coumaphos strips are not registered for use in honey bee colonies in Canada. This is a serious threat to the beekeeping industry in Ontario. Studies should be initiated to assess the potential damage that can be caused by the Small Hive Beetle in Ontario. Development of control measures that fit into the practiced management to control the Small Hive Beetle is essential to protect the beekeeping industry.

II. Research Inventory: There is an immediate need to assess the potential damage that can be caused by the Small Hive Beetle to the beekeeping industry in Ontario. The OBA would like to direct some resources to Dr. Medhat Nasr to assess the potential damage, to develop management techniques to control the beetles and to disseminate this information to beekeepers. This must be done as soon as possible to avoid any major damage to bee colonies. Thus, beekeepers will be able to provide farmers with the necessary honey bees for crop pollination.

Sector Priority

Apicultural Research Priorities

1. Assessment of the Small Hive Beetle damage, development of management techniques, and dissemination of developed information to beekeepers.

2. Development of a Varroa mite-resistant bee stock using different selection approaches and continue to integrate resistance to tracheal and varroa mites into one bee stock.

3. Development of effective integrated pest management (IPM) programs for control of parasitic mites and infectious diseases of honey bees.

Pollination Research Priorities

1. Quantify pollination requirements of producing crops to improve the effectiveness of honey bees and alternative insects as pollinators especially for apples, cucumbers, greenhouse tomatoes, squash, pumpkin, blueberries and red clover.

2. To initiate studies directed at pollinator conservation and best management practices for pollinator diversification in the agricultural sector and for natural sustainable productivity.

Service Priorities

1. Augmentation of mite-resistant bee stocks and the IPM program for controlling tracheal and varroa mites in Ontario and creation of new markets for Ontario queens.
2. Maintenance of the apicultural regulatory and extension programs in the province of Ontario.
3. Support the registration of Coumaphos (Checkmate) strips in Canada.
4. Integration of the extension of pollination services into the Horticultural Extension Programs of crop technology for better services to the farming community.
5. Support the registration of the single application formic acid pads (*MiteAway*).
6. Monitor the residues of Apistan in honey and bees wax.
7. Monitor the resistance to Terramycin.
8. Monitor the resistance to Apistan in varroa mite infected areas.
9. Development of marketing strategy for honey to replace imports.
10. Support the continued ban on the importation of honey bees to Canada from mainland US.

APPLES

Top 10 Priorities

1. Evaluate the Performance and Marketing Potential of New and Advanced Apple Selections for Ontario
2. Development of Sustainable IPM Practices and Resistance Management including optimization of sex pheromone based monitoring and mating disruption of the Obliquebanded Leafroller in Ontario
3. Identifying Sensitivity of Fungicides to Apple Scab and summer diseases.
4. Development of an Integrated Approach for the Control of Apple Scab and Other Foliar and Fruit Diseases of Apple.
5. Novel Approaches to sustainable management of fire blight, using biological control agents (short term) and genetic transformation to increase host disease resistance (long term)
6. Determination of optimal rates and cultivar sensitivity to ReTain on preharvest fruit drop and fruit quality after regular and CA storage.
7. Orchard Management Production and Storage Systems for Sustainable and Profitable Production
8. Storage Rots of Pome Fruits: Efficacy of Current and Potential New Fungicide Use Strategies and Biological Control Agents.
9. Non-chemical Control of Superficial Scald as well postharvest research on 1-MCP
10. Development of an Advanced IPM Program for Ontario Apple Orchards

Research Priorities 11-19 (Not Prioritized)

- Define Optimum Crop Loads for Major Apple Cultivars Grown in Ontario
- Research on Orchard Nutrition and Micronutrients
- Management of Crop Load of New Apple Cultivars
- Pollination of Higher Density Apple Orchards
- Development of Pest Management Strategies for the Dogwood Borer on Dwarfing Rootstocks
- Efficacy Testing, Pesticide Timing and Evaluation of Biological Controls for Managing European Apple Sawfly
- The Use of Predatory Mites as Biological Control Agents in Ontario Fruit IPM Programs
- The Use of Predatory Mites as Biological Control Agents in Ontario Fruit IPM Programs
- Evaluation of Bird Repellents and Controls in Grape, Tree Fruit and Berry Crops

BERRY CROPS

1. **Breeding new berry crop cultivars:**
   - Breed new June-bearing strawberry cultivars with firm fruit and long shelf-life for the fresh market. Strawberry cultivars, including dayneutrals, are needed in a wide range of maturities, especially for the late and early seasons.
   - Breed new raspberry cultivars with improved fruit quality, disease resistance and winter hardiness.
2. **Develop sustainable crop production systems with emphasis on disease, insect and weed control strategies, and alternatives to soil fumigants:**
   - Develop integrated weed control strategies for reduced pesticide use and crop losses in strawberries and raspberries.
   - Determine economic thresholds for the control of foliar diseases of strawberries (ie leaf scorch, leaf blight and powdery mildew).
   - Develop year-round cropping systems for strawberries and raspberries.
   - Develop effective, cost-efficient bird control strategies for blueberries.
   - Develop integrated control systems for raspberry cane diseases and fruit rots including chemical and biological control systems.
   - Develop integrated pest management schemes for reduced pesticide use and crop losses in strawberries. Investigate methods of controlling tarnished plant bug. Determine the epidemiology of anthracnose fruit rot in Ontario and develop integrated management options.
   - Develop biological mite control strategies for raspberries.
   - Re-evaluate and re-establish provincial recommendations for micro- and macro-nutrients for strawberries.
3. **Examine physiological and economic potential of new or non-commercial berry crops.**

Service Priorities

1. **Technology transfer of sustainable crop production systems for berry crops including integrated pest management and food safety.** Sustainable berry production systems need to remain competitive and profitable. Research and technology from around the world must be adapted to meet the needs of Ontario growers under Ontario conditions.

   Growers raised the issue at the November 9th meeting of more rapid access to extension personnel so that inquiries can be dealt with in a timely manner. Two-way communication with growers and others in the berry industry through agriphones, newsletters, the internet, presentations, farm calls and individual contact is essential to transfer current technology and information.

2. **Rapid disease diagnostic service.** Techniques are becoming available for rapid diagnosis of crop diseases. It is essential to the crop industry that these techniques be available at a reasonable cost with a quick turn-around time.

3. **Berry crop propagation program.** The Plant Propagation Program is the foundation of the Ontario industry. The OBGA was originally formed in the mid-seventies to reinstate the program when OMAF discontinued it. Over the years, the industry has assumed more and more of the responsibility and costs associated with the program. A number of researchers have been involved in the Ontario berry crop propagation program. It is essential to the program that these researchers continue to provide technical expertise, and maintain and produce Nuclear stock.

4. **Minor-use pesticide registrations for berry crops.** Minor-use registrations are needed to maintain a competitive toolbox against pests. Many registrations in berry crops are old and likely to be cancelled as FQPA takes effect. While new products are being registered in Canada for crops with large acreages (ie field crops), there are few new registrations for high-value, low-acreage crops such as berries.

CRUCIFER CROPS

Minor Use Priorities

1. Proclaim (emamectin benzoate) for Lepidopteran pests
2. Maxim (fludioxonil) seed treatment for *Rhizoctonia, Fusarium*
3. Regent/Canon (fipronil) seed treatment for cabbage maggot
4. Agrimek (abamectin) for leafminers
5. Pirimor (pirimicarb) for aphids
6. Cruiser/Actara (thiamethoxam) for aphids and thrips
7. Fulfill (pymetrozine) for aphids

8. Aztec (cyfluthrin) for cabbage maggot
9. Garlic Oil for cabbage maggot on rutabagas

Research and Service Priorities

1. Pursue **minor use pesticide** registrations for improved control of insects, diseases and weeds of crucifer crops, especially specialty crucifers. In light of the US FQPA and continuing lack of a 'level playing field' for Ontario growers, the registration of new,'reduced risk' active ingredients is also urgently needed. Increased cooperation with the US IR-4 program is strongly encouraged. In addition the need for GLP certification of Univ. of Guelph and AAFC field stations is required for all future minor use residue trials. **R & S**

2. Investigate, develop and transfer practical **pest control methods** for cruciferouscrops. Group 1 **(established pests)** includes evaluation of plant species as trap crops for flea beetles, thrips, caterpillars and other insects; evaluation of varieties with resistance to pests, and evaluation of biological controls and cultural practices for the control of various insects and diseases. For **cabbage maggot** emphasis on developing a revised degree day model, improving monitoring methods, developing registered seed treatments (fipronil, chlorpyrifos) and plug tray drenches. In light of the loss of Birlane and Furadan in rutabagas, new and improved strategies are urgently needed. Group 2 **(New pests)** includes evaluation of the biology and management strategies for vegetable leafminers, broccoli heart maggot and seed corn maggot. **R & S**

3. Develop an improved **black rot** disease management strategy with emphasis on extension of known greenhouse management strategies and seed treatment technologies. Investigation of transplant treatments that may reduce the spread of black rot are also suggested. **R& S**

4. There is a need to investigate **fertility practices** for crucifer crops with special emphasis on an integrated fertility program which takes into account the complete soil nutrition regime. A special focus on the needs of organic (muck) soils is needed also. A literature review of this topic is also suggested to clarify what is already known in North America. Because **clubroot** disease is greatly affected by fertility practices, evaluation of clubroot management strategies should be an integral part of any fertility research. **R & S**

5. Investigate and develop management strategies for the control of ***Rhizoctonia*** diseases of cruciferous crops, specifically scurf on radish, damping-off and wirestem of cabbage, cauliflower and broccoli. **R**

6. Continue to survey and identify diseases and pests of **specialty crucifer crops** with emphasis on detecting problems which may be a threat to traditional crucifer vegetables, especially **virus** diseases. **R**

7. Continue to evaluate cole crop **varieties** for suitability to Ontario growing conditions, storage conditions, market demand, pest and disease resistance with emphasis on the spacings and yields of broccoli. **R**

GINSENG

URMULE PRIORITIES:

1. *Quadris / *Sovran for control of Rhizoctonia and Cylindrocarpon
2. **Topas for control of Rhizoctonia and Cylindrocarpon
3. **Poast / **Fusilade for control of weeds especially grasses
4. Subdue for Rhizoctonia control
5. Elevate for control of Cylindrocarpon
6. Seed treatments for control of Pythium, Rhizoctonia, Cylindrocarpon
    - I. Raxil
    - II. Dividend

* Ready to submit minor use after registration

** Submitted and waiting to complete residue data

RESEARCH PRIORITIES

GROUP A (formerly pest management priorities)

1. Registration of minor use compounds for disease and weed control.
2. (tied with 1) Identification and control measures for the disease termed "rusty root".
3. Identification and control of seedborne diseases.
4. Non chemical disease management
    - fumigation alternatives
    - irrigation and disease management
    - use of mulches for disease management
    - tools for rapid identification of root / seed disease
5. Use of soil amendments to control ginseng diseases.
6. Identification and control of ginseng replant disease.
7. Use of tillage (subsoiling, garden landscaping, anti-splash material in trenches) to control disease.
8. Analysis of appropriate spray coverage and disease control in an effort to reduce the number of fungicide sprays.

GROUP B (formerly cultural management priorities)

1. Investigation into the identification of new germplasm in the development of disease resistance and root shape and quality.

2. Evaluation of factors associated with root quality and development of a quality assurance program for ginseng.
3. Investigations into plant spacing and various mulches on root quality.
4. Identification of fertility practices for the production of quality roots.
5. Investigations into the timing and amount of irrigation necessary for the production of quality roots.
6. Investigations into the chemical deflowering of ginseng.
7. Investigations into the factors affecting seed germination with a view to shortening the length of time during stratification.
8. Analysis of the cost of production of ginseng and identification of effective cost cutting factors in production.

Ginseng Research Priorities (combined and prioritized)

1. Investigations into minor use registrations for control of diseases and weeds in ginseng.
2. Control of root diseases.
3. Development of new varieties through micropropagation and germplasm assessment.
4. Investigation into the etiology of seed diseases and their control.
5. Identification of the factors associated with ginseng root quality and the development of a quality assurance program.
6. The control of ginseng diseases through non-chemical means including field evaluation of microbial control techniques.
7. The aspects of ginseng fertility that lead to quality roots.
8. Investigation into seeding density and various mulches on the quality of ginseng roots.

GRAPE AND WINE

A. RESEARCH PRIORITIES	Personnel	Priority
Biotechnology - vine health	Nassuth/Paroschy/Stobbs	1-B
Pathology, pesticide usage	McSmith/Northover	1-B
Variety/clone evaluation - wine, table	Fisher/Paroschy/Reynolds/Zandstra	2-B
Nutrition, irrigation, water relations	Derkacz/Kennedy/Reynolds	2-B
Soil management/rehabilitation	Bellamy/Derkacz/Fisher	2-B
Cover cropping, minimal tillage	Fisher	2-B
Trellising/spacing	Fisher/VandenHeuvel/Zandstra	2-C
Site selection - GIS/GPS development	Reynolds, Fisher	2-C
Biotechnology - yeast improvement	Subden	3-C
Rootstocks - wine/juice grapes	Fisher/Zandstra	3-C
Icewine production - cellar techniques	Inglis	3-C
Icewine production - pathology	McSmith/Northover	3-C

B. SERVICE PRIORITIES

Weather Network Consortium	UG/AAFC/OGGMB/CCOVI OTFPMB/WCO/OMAFRA/NC	1-B
Information packaging (Web, hard copy)	Fisher/Fraser/Ker/McSmith	1-B
labrusca/vinifera best management practices (Many segments)	Slingerland/Walker	

C. INDUSTRY PRIORITIES

VQA legislation/implementation	WCO/VQA	1-C
Appellation development	VQA/Reynolds/Ker	2-B
Crop estimating techniques	Ker	3-B

GREENHOUSE AND PROTECTED CROPS

A. Greenhouse Vegetables

Research Priorities:

1. Evaluate new and old pest and disease control measures (including application methods) and implement IPM strategies for control of powdery mildew in cucumbers, tomatoes and peppers, Pythium root rot and Penicillium in cucumbers, and, Botrytis in all vegetables.

2. Develop and evaluate environmental strategies that optimize plant growth, productivity, and fruit quality, as well as integrated pest management techniques in greenhouse vegetables.

3. Maintain research on soilless culture with emphasis on recycling nutrient solutions and disease management to improve profitability and sustainability.

4. Develop an expert system for integrated crop management of greenhouse peppers that will incorporate production, climate, disease and pest management strategies.

5. Evaluate new types of crops, cultivars, and post-harvest technology procedures (including packaging and labelling) to optimize yield and fruit quality.

Priorities for Minor Use Registrations

1. Heritage (azoxystrobin) or Flint (CGA 279202) – powdery mildew
2. Knack (pyriproxifen) – whiteflies
3. Conserve (spinosad) – Western flower thrips
4. Decree (fenhexamid) – Botrytis
5. Rootshield (*Trichoderma harzianum)* – root diseases

6. Ethrel – fruit ripening agent
7. Citation (cyromazine)
8. Botanigard (*Beauveria bassiana*) – whiteflies
9. Cinnamite (cinnamaldehyde) - spider mites
10. Dimilin (diflubenzuron) - caterpilars

FS2002 priorities:

1. Development of control strategies foe economically important plant diseases such as powdery mildew, Pythium, Botrytis and Bacterial Canker.

2. Development of strategies for improving control of new and old pests that disrupt IPM programs, such as thrips, lygus bugs, cucumber beetles.

3 Investigate the potential for the use of disinfectants such as chlorine bleach, Virkon, and Physam 20, and the fungicide Phyton 27, as protectans against diseases, particularly bacterial and fungal diseases.

4. Efficacy testing of fungicides and disinfectants against such fungi as *Trichoderma harzianum, Verticillium fungicola, Mycogona pernicious* and *Cladobotryum (Dactylium) dendroides*.

5. Identification of sites and form of dormant stages of bacterial and fungal pathogens in order to effect rational control between crops with disinfectants and modifications of cultural practices.

B. Mushrooms

Research Priorities:

Commercial mushrooms
Long term priorities (2 to 4 years)

The committee in 1998 established the following as long term priorities:

Environmental issues:a) compost odor management
b) influence of mushroom farming practices on the water table

Production orient: a) mushroom quality improvement
b) enhancement of value, eg nutriceuticals

The 1999 committee continues committed to these two long term priorities.

Short term priorities (within two years)

The committee was provided with the 1998 list of short term priorities. They were asked to delete or add to the list and to select the top three priorities.

There was no consensus for priority. In general, "production" oriented research was favored over "insect and disease" management investigations. This is also reflected in the long term priorities.

The following are the lists of 1998 project possibilities from which the committee was asked to choose.

Insect and Disease

Determine the effectiveness of fungicides, fungi static materials and barrier techniques to manage *Trichoderma* green mould on the casing and in the compost.

Determine post-crop temperatures and post-harvest management procedures necessary to eradicate a *Trichoderma* green mould infection.

Determine factors that contribute to an airborne *Trichoderma* green mould infection.

Provide the necessary information required by AAFC for registration of products already registered in the USA.

Production

Pinpoint the most probable procedures or materials used during Phase I composting that produces offensive odors.

Determine influence of straw cultivars, poultry litter bedding, feed additives, ammonia suppressants and pesticide residues on composting, mushroom production and human health.

Develop a method to detect ammonia suppressants in poultry litter.

Determine the effect of water quality on mushrooms.

Develop criteria for sugar beet lime as a casing material.

Prepare a literature review of the nutritional benefit of mushrooms

Research interests - specialty mushrooms

Insects and diseases

Work with pesticide companies to expand pesticide labels to include specialty mushrooms

Production

Develop "sporeless" variety of oyster mushroom

Evaluation strains to optimize production and quality

Optimize environmental management to maximize production and quality

Service Priorities:

commercial mushrooms

1. Necessary services: identification of insects, diseases and weed moulds; telephone and on-site consultations; workshops resulting from research and specific training videos.
2. Important but not necessary: compost odor analysis

Note: There is increasing interest to broaden the necessary services eg. including compost odor analysis and compost/casing analysis.

Specialty Mushrooms

Necessary services: disease analysis; telephone and on-site consultations; information centre on advances in specialty mushroom production

GREENHOUSE FLORICULTURE

After considerable discussion by growers, allied trade representatives, research and extension specialists in attendance, it was agreed that the identified research needs as outlined in the 1998 report should remain the same with only minor modifications to reflect emerging issues. The chair circulated the research priorities and goals set out by the American floriculture industry through their national organisation, The Society of American Florists. As one would expect the research priorities and goals mirror in a very similar way those of the Ontario industry.

Integrated Nutrient and Water Management Strategies

The environmental impact of fertiliser, water and pesticide use in the greenhouse floriculture industry has become a topical issue in any discussion on greenhouse crop management. The industry is fully aware of the direction that has taken place in the Netherlands regarding "zero-run-off" of greenhouse effluent.

The application of nutrients through top irrigation is currently the industry standard. There is a need to be aware and understand what, if any, is the environmental impact of greenhouse run-off water under different cropping systems using top irrigation. Direct collection of excess nutrient solutions or use of biological filtering systems are but two possibilities that appear to be cost effective options available to growers.

Closed, recirculating subirrigation systems is one option being adopted by potted plant growers. Fertility requirements and the timing of applications need to be refined for individual crops to insure optimal growth and plant quality. What are the root zone requirements of plants in closed nutrient recycling systems? Determination of water and nutrient budgets for different production systems and crops and how this relate this to the incidence of disease and post-production quality is needed.

Most growers in the industry feel subirrigation systems are not well suited for many bedding plants because growth and flowering has been controlled primarily through restrictinging water

and fertilisers. The use of additional growth retardants is one option but not generally favoured because of the concern about garden performance. Determination of nutrient loss or waste in bedding plant production systems needs to be determined.

Closed, recirculating top irrigated systems are currently being used in the production of such flower crops as roses and gerbera which are long term crops. The problem of organic root exudates and the accumulation of undesirable ions such as sodium and chloride in these systems still need resolution.

Technological change in water and nutrient management has occurred far more quickly than our knowledge of their impact on disease management. The impact of different plant pathogens such as *Fusarium, Pythium, Phytopthora, Rhizoctonia* and *Erwinia* in closed nutrient recycling systems on yield and plant growth is not well understood and requires quantification for a wide range of floricultural crops. Currently growers with the capability to recycle nutrients have been thwarted to some extent in their recycling attempts because of disease problems. As a result, the epidemiology of these pests within these systems needs further investigation. Research into the control of pathogens should be a two-pronged approach including the development of biocontrol agents and strategies as well as the investigation of technologies such as ozonation, UV radiation and heat treatment. Monitoring the efficacy of the technology in a commercial setting becomes a grower's nightmare.

Growers consider the need for grower friendly, accurate, rapid diagnostic tests to confirm the level of inoculum of the forementioned organisms and others, an important goal to assist them in making informed production-oriented decisions.

Development of Improved Floricultural Crops and Production Techniques

Development and evaluation of new crops and new cultivars of existing crops for enhanced horticultural characteristics including improved plant growth habit and flowering characteristics, increased pest and disease resistance, and post-harvest shelf-life under Ontario growing conditions is considered important to all growers within the industry.

The retail sector thrives on the introduction of new and different crops. Although the sales of traditional cut flowers such as roses and chrysanthemums or flowering plants such as pot mums remain strong (still increasing in sales value) alternate crops are also becoming increasingly more popular.

In terms of the greenhouse environment itself, growers have over the past two decades become very efficient at using all the available space and utilising the latest technology to improve production and shorten production time frames. Manipulation of light quality and quantity for example, continues to be a key factor in shaping plant growth and development.

Plant modification research is needed to improve the efficiency and quality of existing and the new crops being developed in the following three broad areas.

I. The development of new cultivars with enhanced light harvesting qualities through gene manipulation to improve growth and quality during the low light winter months.
II. The development of better environmental control systems to manipulate the natural plant hormones including gibberellins and ethylene.

III. The ongoing need for applied, production-oriented research to establish the best crop management practices including media and nutrition, chemical growth regulation requirements and cultivar evaluation under Ontario conditions.

Post Harvest Handling and Shelf-Life Issues

Maintaining the shelf life of various flowering potted plants and bedding plants is an important issue for both growers and buyers from the large retail chains. Growers are concerned that they are losing control of their product once it leaves the greenhouse and contact with individual store managers. The process of the product leaving the greenhouse to the individual chain store easily requires a minimum of three to four days. Plant quality becomes a major concern as more and more of the products are sold through chain stores. Consolidation across the retail industry continues and will only compound existing post-harvest problems. As the export market grows, more floral products are being shipped longer distances by tractor trailer.

Ethylene, both internal plant generated and/or external generated, as well as other factors involving storage appear to be causing serious plant quality problems. Reducing premature flower senescence, leaf yellowing and leaf epinasty is critical to the continued growth of flower sales through the mass market outlets.

Assessment of the levels of ethylene present throughout the marketing chain has determined that problems can arise anywhere throughout the distribution system and that some of these incidents can be quite severe. Research needs to continue to focus on the use of ethylene inhibiting compounds, how they function and where within the production/distribution network these compounds can be utilised and the impact of greenhouse production factors on post-harvest responses. In the longer term genetic manipulation needs to be examined as a tool to provide commercial flower crops with an internal resistance. This is becoming increasingly important as more and more of the floral product produced is marketed through supermarket chains where the flowers are in contact with ethylene producing fruits and vegetables.

Development and Implementation of IPM programmes in Floriculture

The industry is currently increasing the use of biocontrol systems to control insect pests. However, continued research is required on IPM strategies for several key pests, including western flower thrips, fungus gnats and shore flies and two-spotted mites in order to reduce the considerable pesticide input required to control these pests.

Continued support of research projects that focus on the management of the western flower thrips and the tospovirus complex is needed because of the devastating losses that can occur. Crops such as Cineraria can experience 100% loss. Understanding the chemical basis of plant resistance to the western flower thrips could be an important tool for plant breeding programmes.

Management studies to better understand the activity and damage caused by fungus gnats and shore flies and their role as vectors in the transmission of plant pathogens is increasingly more important.

Not only are studies of biological and cultural control strategies, including the impact of screening important, but priority should be given to the development and registration of compatible "biorational products".

Integrated disease management is not nearly as well understood as integrated insect management. Epidemiology studies of major disease causing organisms including *Pythium, Phytopthora, Rhizoctonia, Fusarium* and *Erwinia* are needed as a result of the rapid production changes that have occurred within the industry. Losses can be significant, for example cyclamen losses due to *Fusarium* can be as high as 50% in recirculating systems or calla lily losses due to *Erwinia* can be as high as 70%. Many products claiming biocontrol and root growth enhancing properties are being promoted to the industry with limited scientific data. Evaluation of these biocontrol products is needed relative to individual disease organisms and crop specificity, their efficacy

within recirculating irrigation systems, and whether any potential antagonisms exist between biological organisms so that growers can establish a fully integrated pest control programme which includes both insects and diseases.

Botrytis and powdery mildew are both aerial pathogens that are constantly the scourge of the flower grower. The industry supports further research to develop biological control agents that will prove efficacious under typical commercial greenhouse climates.

Because bacterial wilt of geranium (*Xanthomonas campestris* pv. *Pelargonii*) is such a devastating disease of a key floriculture crop and because of the potential to lose consumer confidence, a serious need exists to investigate any potential genetic basis of resistance including the use of biotechnology.

LOW ACREAGE & SPECIAL CROPS

1) Minor Use Work:

Cucurbits	Sovran and/or Flint for powdery mildew
Asian Cruicifers & Leafy Greens	Proclaim for lepidoptera pests

Seed Treatment	Maxim -vegetables, rhizoctonia & fusarium
Eggplant	Admire for Colorado beetle control
Leafy Vegetables	Actigard for disease suppression
Parsley	Quadris and/or Topas for leaf blight control
Peppers/Cucumber/Squash	Command for weed control
Garlic	Prowl for weed control
Sweet Potatoes	Dual & Command, Broadleaf weed control
Leeks	Matador for thrips control
Hemp/Sorghum/Millet	Captan for seed decay and seedling rot

Minor use work continues to be high on the list of priorities with growers. Growers are still struggling to keep pace with product availability with U.S. counterparts. The several minor use registrations obtained this past year (1999) was most appreciated by respective stake-holders. However, new work needs to be initiated and carried forward if growers are to have any chance at all competing in an ever-globalized marketplace.

II. Pest Management:

a) Green Beans & Alternaria

The snap bean growers have experienced severe economic loss due to alternaria this past season. This problem needs to be addressed to reduce crop loss, and maintain a viable fresh-market snap bean industry in Ontario.

b) Striped Cucumber Beetles

Striped cucumber beetles (SCB) continues as an important insect pest of Ontario vine crops. Research has not identified insecticide resistance in tested populations. Significant SCB-damage is often felt to be the result of short-persistence of foliar insecticides and rapid early-season vine growth. New management options such as seed and planting treatments and improved grower education on SCB-behaviour should reduce future SCB-problems

c) Club Root & Asian Cole Crops

Club root continues to be a serious disorder among many cole crop farms in Ontario. Soil pH and the type of lime and calcium are becoming better understood, but more work is required make final conclusions and therefore recommendations to growers.

d) Sugar Beets & Leaf Diseases

Sugar beets have made amazing in-roads into the markeplace. However, this quick start has left some of the applied work behind, and research is required to better address foliar diseases of this crop.

e) Sugar Beets & Root Aphids

Most growers have no or little awareness of what root aphids are doing to their sugar beet crops, and most extension and industry personnel don't either. This pest is thought to be more widespread and damaging than given credit for, and therefore, its effect need to be better

understood and quantified as regards the economic impact.

f) Garlic & Latent Virus Diseases

Although work has already begun to address this problem, more research is required to implement a disease-free seed stock program similar to that of both stawberries and potatoes.

3) Variety Testing:

Asparagus, Cucumbers, Garlic, Herbs & Medicinals, Rice, Stevia, Okra, Peppers, Sweet Potatoes, Sugar Beets, Sorghum & Millet, Peanuts, Chickpeas

Variety work has always been an important part of minor crop research. As more and more crops come under the jurisdiction of this committee, the supporting research needs to be addressed accordingly. Even the more traditional crops such as melons, beans and peppers, for example, are changing at a rapid rate, and new industry standards must be compared to in order to offer growers the best recommendations.

Asparagus Research Subcommittee Report –see attached.

4) Foliar Fertilizer Testing:

Growers are using more and more foliar feeds to maintain the health and vigour of their crops, however, all too often the result of these practices are only anecdotal and lack any hard research to support these claims. Work is very much needed to investigate the possibilities and advantages of foliar fertilizers. In addition, calcium formulations for powdery mildew control has been reported but untried here in Ontario.

5) Value-Added Processing & Marketing

Given the lack of commodity price increases, growers are having to be more imaginative in their approach to on-farm production. Therefore, ways in which to improve the value of fresh-market crops needs to continue in its investigation.

MUCK CROPS

1. Onion Thrips
2. Integrated Crop Management of Onion White Rot
3. Fertility Issues: (Impact from Nutrient Management Planning)
4. Minor Use
5. Rhizoctonia- Carrots
6. Integrated Weed Management for Onions
7. IPM & ICM for all pests and diseases
8. Management of Carrot Storage Diseases
9. Onion Maggot/Smut

10. Nematodes
11. Vegetable Leafminers
12. Sprayer Evaluations
13. Cultivar Evaluations

NURSERY/LANDSCAPE & TURFGRASS

Research

1. Water use and management
2. New pests and changes in availability of control methods
3. Nutrient management/organic waste

Service

1. Technology transfer on water use/management
2. Improved access to research information/technology transfer
3. Woody plant pathology - continuing education and professional development
4. Turfgrass management research

POTATO

1. Soil borne diseases: scab, rhizoctonia, early dying. These diseases are of major importance in potato production. Because crop rotation is not an effective method of control, research is needed to identify environmentally friendly methods to reduce their incidence.

2. Wireworm Control. At present, there are no effective chemicals to control wireworms. Potato growers who grow forages as a rotation for a number of years, risk serious losses due to wireworm damage. Evaluation of new materials to control wireworms is urgently needed.
3. Variety Testing. To remain competitive, potato growers must grow varieties with the characteristics that consumers demand. In addition, these varieties should have the yield and disease resistance to produce a profitable crop. Testing new varieties under Ontario conditions is crucial for the selection of varieties that the provincial market requires.

4. Monitoring Chip Quality in Storage. Biochemical mechanisms involved in low temperature sweetening of processing potatoes should be investigated. Also changes in tuber respiration in response to different storage temperatures should be evaluated to predict the chilling sensitivity or tolerance of cultivars.

5. Late Blight Detection in Infected Seed Tubers. Late blight is the most devastating fungal disease of potatoes. Infected seed tubers are major sources of inoculum. A technique to detect infected seed tubers before planting would decrease the risk of late blight epidemics.

6. Minituber Production. The production of minitubers at the Spud Unit is critical for Ontario seed potato growers. Research to improve production practices and yield is needed.
7. Food Safety: Water quality and Manure Applications.

8. Monitoring CPB Insecticide Resistance. The Colorado Potato Beetle has demonstrated a tremendous ability to develop resistance to insecticides. Admire is the only insecticide currently registered in Ontario that is effective on all CPB stages. In 1999, no resistance to Admire was detected in 17 CPB populations from the province. Monitoring the potential development of resistance to Admire is extremely important to alert growers when the first signs of decreased susceptibility to this insecticide is detected.

SERVICE PRIORITIES

1. Registration of Curzate (Late Blight) and Quadris (Early Blight). Both fungicides are registered in the US and provide good control of these diseases.

2. Maintain Tissue Culture Lab at New Liskeard. The tissue culture Lab of the SPUD Unit in New Liskeard is critical for the Ontario Seed Potato Industry

SWEET CORN

1. Cultural Practices. There is a need for research on management systems which will improve yields and reduce input costs in sweet corn production. This should include fine-tuning production systems specific to different cultivars and for production of certified organic sweet corn. This would include research on row spacing, plant populations, fertility (pre-side dress nitrogen test), reduced tillage and other methods which contribute to earliness.

2. Weed Control. Continued work on herbicide label expansions of field corn herbicides is needed, as well as a better understanding of integrated weed management for sweet corn.

3. Cultivar Evaluation. With the continued release of large numbers of cultivars by seed companies, cultivar evaluations need to continue in order to keep the industry aware of these new products. These evaluations are useful to growers, processors, and seed companies.

4. Insect Control. European corn borer control continues to be a challenge in most years. Corn earworm can also cause heavy damage in some years. Aphids are no longer considered only a cosmetic pest with no economic importance. The recent problem with stewarts wilt has made the corn flea beetle an insect of concern. Continued evaluation of new insecticides and alternatives to insecticides for these pests is needed.

TENDER FRUIT

The following tables indicate the areas of research considered desirable, the priority in terms of need or importance and the level of research desired.

Tender Fruit Research Priorities- 1999

Breeding		**Varieties**		**Biotech**	
Peach Fresh	1B	Peach Fresh	1B	Peach Fresh	1B
Peach Processing	1C	Peach Processing	1C	Peach Processing	1B
Nectarines	1B	Nectarines	1B	Nectarines	1B
Sweet Cherry	1C	Sweet Cherry	1C	Pear	1C
Sour Cherry	-	Sour Cherry	3C		
European Plum	2C	European Plum	2C		
Japanese Plum	2C	Japanese Plum	2C		
Apricot	2A	Apricot	2C		
Pear	2C	Pear	1C		

Rootstock		**Nutrition**		**Nursery**	
Peach Fresh	2C	Peach Fresh	2B	Peach Fresh	1B
Peach Processing	2C	Peach Processing	2B	Peach Processing	1B
Nectarines	2C	Nectarines	2B	Nectarines	1B
Sweet Cherry	1B	Sweet Cherry	2B	Sweet Cherry	1B
Sour Cherry	2C	Sour Cherry	-	Sour Cherry	-
European Plum	2C	European Plum	2B	European Plum	-
Japanese Plum	2C	Japanese Plum	2B	Japanese Plum	2B
Apricot	-	Apricot	-	Apricot	-
Pear	1C	Pear	1B	Pear	1B

Pruning/Training		**Orchard Management**		**Thinning**	
Peach Fresh	1C	Peach Fresh	1C	Peach Fresh	2A
Peach Processing	1C	Peach Processing	1C	Peach Processing	2A
Nectarines	1C	Nectarines	1B	Nectarines	2A
Sweet Cherry	2B	Sweet Cherry	2C	Sweet Cherry	-
Sour Cherry	-	Sour Cherry	-	Sour Cherry	-
European Plum	-	European Plum	-	European Plum	-
Japanese Plum	1C	Japanese Plum	-	Japanese Plum	3A
Apricot	-	Apricot	-	Apricot	-
Pear	1C	Pear	1C	Pear	1A

Irrigation		Harvest		Post Harvest - Storage	
Peach Fresh	3A	Peach Fresh	2A	Peach Fresh	2B
Peach Processing	3A	Peach Processing	1A	Peach Processing	2B
Nectarines	3A	Nectarines	2A	Nectarines	1B
Sweet Cherry	2C	Sweet Cherry	-	Sweet Cherry	2B
Sour Cherry	-	Sour Cherry	-	Sour Cherry	-
European Plum	-	European Plum	2A	European Plum	-
Japanese Plum	-	Japanese Plum	2A	Japanese Plum	-
Apricot	-	Apricot	-	Apricot	-
Pear	2A	Pear	2A	Pear	1A

Post Harvest – Processing		Post Harvest – Minimal Processing	
Peach Processing	1B	Peach Fresh	3C
Pear	1C	Sour Cherry	1C

• OMAFRA Publication 430 'Fruit Cultivars' - outdated, requires revision.	1 A
• Weed management - information package/workshop on integrated approach	1 A
• Tree census: interim census (annual updates on plantings/removals) - track tree fruit inventory.	1 B

Plant Health – Plum Pox	
Peaches, necatarines and plums	1 A
- rapid virus detection techniques to be developed/implemented	

- OFM pheromone disruption technology for control of Oriental Fruit Moth
- Organophosphate review by PMRA, FQPA impact, and Identification of high priority pest control products and potential alternatives
- Need for expanded tender fruit pathology
- Need to maintain current Bio control of fire blight
  - short-mid term, complementary to (long term) breeding program

- MII - new/replacement to complete project
- Black Knot on Plums and Sour cherries

Establish best management practices for new and existing orchards through:
Spray recommendations and cultural practices of existing orchards and Proposal for CanAdapt funding - best management practices for new and existing plum selections and cultivars

OCPC priorities (as circulated) Ratings by TFRSSC:

- Brown rot control strategies integrating cultural and chemical control
- IPM pear resistance management stategies
- Efficacy testing of new fungicides for control of diseases of stone fruit
- Genetic Transformation to increase fire light resistance in commercially important pear cultivars
- Predatory mites as biological control agents
- Identification and development of alternatives to soil fumigants
- Evaluation of bird repellents and controls

Registration needs (rankings) under URMUR program – OCPC Fruit Subcommittee:
1. Indar
2. Actara
3. Medallion
4. Methyl anthranilate
5. Flint

Registration needs (rankings) under URMULE program – OCPC Fruit Subcommittee:
1. Vanguard
2. Confirm
3. Admire
4. Abound

TOMATOES

1. Breeding and cultivar evaluation for processing tomatoes remains as the first priority. Emphasis should be placed on earliness, disease, pest, and herbicide resistance, reduction of mould counts, firmness, peeled colour, field storage capability, field and factory yield, lycopene content, fruit size, and tolerance to blossom end rot.

2. Bacterial diseases are persistent problems for both fresh market and processing tomato growers. The development of diagnostic tools and management strategies, including

biological control, and improved methods to detect bacterial diseases of seed and plug plants is a high priority.

3. Sustainability of high yield and quality by studying soil structure, rotational and cultural practices, including management of irrigation is required.

4. Cultivar evaluation for fresh market tomatoes is a continuing priority.

5. Continue the development of pest management strategies for insects (e.g. stink bug, Colorado potato beetle), plant diseases, and suppression of nematodes.
6. Work must continue on weed control and crop tolerance evaluations, pesticide evaluation, including cultural practice guidelines, and registration of new materials.

7. Research on cultural practices to enhance earliness is required.

8. Research into plug transplant management and rapid establishment is still needed.

9. Studies on food safety related to processing tomato production and processing are required.

10. Research is required on the neutraceutical effects of compounds present in tomatoes related to health benefits.

11. Studies into the implications and applications of genetic technology are required.

RECOMMENDATIONS ARISING FROM THE
GAPS/BARRIERS/DEFICIENCIES

AGROFORESTRY

Indicated they are able to address their research and service priorities with existing resources.

Response
The OHCRSC commends the chair, Todd Leuty, and the participants of the Agroforestry sub-committee for developing numerous action plans to address their important research and service priorities.

APICULTURE & POLLINATION

Recommendation 1
The Apiculture & Pollination Research and Services Sub-Committee recommends that the Ontario Beekeepers' Association (OBA) conduct an assessment of the impact of the Small Hive Beetle on honey bees and develop control measures.

BACKGROUND: The Small Hive Beetle, *Athina tumida,* is a new pest which has been found in the US. It has killed more than 30,000 colonies in the US. This is a serious threat to the beekeeping industry because there is no registered control agent in Canada. Studies should be initiated to assess the potential damage that can be caused by this beetle and to develop control measures to protect the honey bees.

Response
The OHCRSC recognize the contribution the OBA is taking in actively encouraging the two University of Guelph researchers to conduct the appropriate assessments. We are sure that part of that assessment will be contacting or visiting industry representatives in bordering states especially New York State. Ken Marchant, Canadian Food Inspection Agency, Area program Officier - Plant Protection will investigate what measures the US are taking to possibly quaranteeing this new pest. The chair of the Apiculture & Pollination sub-committee should contact Ken Marchant.

APPLES

Recommendation 2
The Ontario Apple Research and Services Sub-Committee requests that AAFC, Vineland, OMAFRA, ERLD, OASCC undertake a review of the fruit pathology position before Dec. 1st, 2000 with a view to ensuring continuity of research efforts at the January 1, 1999 level.

BACKGROUND: New chemistries are being used and evaluated for apple scab control. Less is known about the control of other apple diseases with these products. These include powdery mildew, cedar apple rust, sooty blotch, fly speck, black rot and various tree cankers and rots. To a certain extent old fungicide programs looked after these problems. A movement toward a narrower spectrum of activity aimed at apple scab would lead to a resurgence of these "minor" diseases. This would require separate products for their control with all the associated costs and technology transfer.

Registration research is done largely by industry and is aimed at the major disease problem (i.e. apple scab). The efficacy of new products need to be examined against the disease complex rather than one or two specific disease. Growers will require education to be vigilant for outbreaks of "minor" problems. A narrow spectrum of activity could also lead to increased chance of resistance to new fungicides. Resistance management strategies will need to be developed along with the diagnostic tools to detect/monitor resistance.
The above issues come at a time when the future of the fruit pathology program at AAFC, Vineland and HRIO, University of Guelph, Vineland are uncertain. The only full-time AAFC scientist working on tree fruit pathology presently is nearing retirement while one of the contract pathology positions within AAFC, Vineland has been discontinued and the other is under review. Furthermore, the contract pathology position at the University of Guelph, HRIO, Vineland is planned to be discontinued by March 2001.

Response
AAFC had set as their target the end of January 31, 2000, to have reviewed the fruit pathology position under their jurisdiction. This recommendations is requesting a broadening of the review to include positions governed by OMAFRA and the University of Guelph. Dr. Frank Marks offered to initiate a joint review to include all the necessary partners to review the overall fruit pathology needs. A letter will be sent to Dr. Clarence Swanton, Dept. of Plant Agriculture and to Bill Ingratta, Director of Crop Technology forewarning them of this review.

BERRY CROPS

Recommendation 3
The Ontario Berry Crops Research and Services Sub-Committee recommends that the Crop Protection Institute (CPI), the Pest Management Registration Agency (PMRA) and the Pest Management Research and Services Committee strongly encourage pesticide companies to pursue joint registration of new pesticides in Canada and the US.

We recommend that harmonization between PMRA and EPA be strengthened to promote joint registration of pesticides in Canada and the US.

BACKGROUND: The US and Canada are moving more and more to harmonization of pesticide registration with joint review now a possibility. However, many pesticides continue to be registered first in the US for a wide range of horticultural and other crops, and then in Canada, at a later date, for a smaller range of crops.
Additional registrations must then be achieved through minor-use registration transferring the cost to Canadian taxpayers. Given that there is limited funding for URMULE/URMUR this restricts the availability of these pesticides for minor crops in Canada and puts us at a disadvantage compared to

our US counterparts. As the Food Quality Protection Act takes effect the horticultural industry in Ontario will become increasingly disadvantaged compared to their competitors in the US. This problem will be further compounded when labs producing pesticide registration data begin GLP increasing the cost and putting more stress on the minor use registration.

Response

In compliance to the new restructuring of OASCC, the OHCRSC will direct this recommendation to the chair of the OPMRSC, Dr. Mary Ruth McDonald. The issue however is critical to the survival of the horticultural industry in Ontario and the OHCRSC is prepared to offer further suggestions and to work with the OPMRSC. The recommendation to PMRA and EPA to harmonize their registration protocols has not resulted in the necessary actions to date. Companies need to pursue and initiate joint registrations. There seems to be differences at the head offices in the understanding of the need to pursue joint registrations involving amoungst other issues as liability and testing/data sharing. This needs to be made known to the company CEOs. In addition the newest employee of the OFVGA, Craig Hunter has offered to further the cause of harmonization through his new duties. Further a workshop on Minor Use issues, including the legal branch, and pesticide company executives and the appropriate associates will be undertaken in an attempt to convince some to work closer with this program which has certainly proved beneficial to the horticulture industry.

Recommendation 4

The Ontario Berry Crops Research and Services Sub-Committee recommends to the University of Guelph and the Ontario Ministry of Agriculture, Food and Rural Affairs, cooperate to equip, staff and train the Pest Diagnostic Clinic to conduct PCR and other rapid diagnostic procedures in a timely and efficient manner.

BACKGROUND: Techniques for the rapid diagnosis of many crop diseases are becoming available. The Ontario Berry Growers Association is currently funding research in the development of PCR-based diagnosis of diseases affecting berry crops, which should be available to the Pest Diagnostic Clinic within three years provided industry and OMAFRA funding continues. These techniques will significantly reduce the time required to identify diseases. Other ongoing research at the University involves the development of PCR-based diagnostic procedures for additional crops.

In today's economic climate, it is essential that growers receive rapid diagnosis in order to make timely control decisions. With the increasing availability of PCR and other diagnostic procedures for many crops, it becomes worthwhile to have the Pest Diagnostic Clinic set up with regards to equipment and personnel to offer these tests.

Response

Laboratory Services, University of Guelph has the necessary equipment to conduct PCR-based diagnostic analysis. A letter will be sent to the Manager of Analytical Services, John Melichercik, requesting the development and publication of a business case for the implementation of this technique both for research purposes and routine client analysis. It is through a business case that will determine the feasibility of developing further PRC-based diagnostic research in the future. The OHCRSC will recommend to funding agencies that new research proposals will require their own business case reflecting the findings of the Lab Services information. OHCRSC was made aware of a meeting Dr. Gary Whitfield, AAFC Harrow, was having with industry representatives

(Berry growers) to develop virus testing protocols possibly using PCR technology. Discussions with John Melichercik are recommended.

Recommendation 5

The Ontario Berry Crops Research and Services Sub-Committee recommends to Agriculture and Agr-Food Canada (AAFC), Vineland open a new position in nematology, initially on a term basis if necessary, to attract a well-trained scientist and provide continuity in the nematology program.

BACKGROUND: This committee appreciates the valuable work of nematologists at Agriculture and Agri-Food Canada in Vineland. The nematology program has provided research results which are important to our industry, and we appreciate the knowledge base that has accumulated as a result of this program at Vineland. However, the full-time person years devoted to nematology research in Ontario has eroded from five down to one since 1984 and the remaining full-time nematologist plans to retire in September 2001. We are concerned about the continuity of the nematology program at Vineland.

Response

Dr. Frank Marks, AAFC, London is aware of the Berry Sub-committee's interest as well as others who have expressed a need for nematology expertise in this province. Dr. Marks is on record expressing AAFC's intent to fill a nematologist position at the time of retirement of the current nematologist.

Recommendation 6

The Ontario Berry Crops Research and Services Sub-Committee recommends to the Expert Committee on Weeds Canada and to the University of Guelph, that weed management research programs at the University of Guelph expand to determine the intervals required between application of new herbicides and planting of berry crops.

We recommend that the Expert Committee on Weeds Canada request that companies provide information on re-cropping restrictions on berry crops with their registration package.

BACKGROUND: Many new herbicides (ie Group 2 herbicides like Pursuit and Broadstrike) used in field crops have residual activity which can be harmful to berry crops for several years after application. Plant-back studies at the Department of Agriculture, Simcoe have shown that some horticultural crops are sensitive to some of these herbicide residues for up to four years. Several fields of first-year strawberries in Ontario have been lost due to Pursuit residues from a previous crop of soybeans.

We expect this problem to increase due to new registrations of long-residual herbicides and increased use in Ontario. Information on re-cropping restrictions is difficult to find. Residual effects of some products are not known, and companies seem reluctant to provide this information because environmental and soil effects will vary the amount of injury.

Response

Referred to Dr. Chris Hall, University of Guelph, Chair of the Expert Committee on Weeds Canada. The OHCRSC recognizes that an additional effort will have to be made to address this

recommendation. In this era of fixed government resources the OHCRSC would like the Berry Sub-committee to indicate how this is to be accomplished, ie what projects presently being undertaken will be put aside or what additional funding is to be acquired to address this urgent request.

CRUCIFER CROPS

Recommendation 7

It is strongly recommended that both the University of Guelph and Agriculture & Agri-Food Canada move to certify personnel and field station sites as GLP compliant in time for the 2000 growing season. If minor use residue trials are to be conducted in Canada, GLP certification is required. Without access to GLP compliant research field sites and personnel, minor use work will be seriously impeded. The delays in the minor use system already place Ontario growers at a disadvantage in the worldwide marketplace. Lack of access to GLP compliant sites will further slow the minor use process.

BACKGROUND: Directed to University of Guelph and Agriculture & Agri-Food Canada
Starting in the year 2000 growing season, all residue trials will have to be conducted as GLP compliant. A large number of minor use projects are proceeding or being planned for vegetable crops in the coming years. If the field stations we rely upon to conduct these trials are not GLP compliant, the trials cannot proceed and many minor uses may not be completed. Most minor uses are already delayed by funding problems and other PMRA requirements. In light of the US FQPA and several serious pest management problems in crucifer crops and other vegetables, the minor use system is the only mechanism available to address grower's concerns and the sustainability of the industry.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.

Recommendation 8

In light of the effects of the US FQPA and the current lack of true 'harmonization' (i.e. Agrimek, Actara, Success, Maxim, fipronil, etc., etc.), the Canadian and US registration systems need to more rapidly become North American in standards for crop protection. In addition, adequate funding to assist minor crops producers and researchers who must conduct trials to GLP standards is required in time for the 2000 growing season. Funding must cover the project requirements and not be limited by fiscal year constraints which do not reflect the reality of such projects.

BACKGROUND: Directed to PMRA of Health Canada and Agriculture & Agri-Food Canada, Policy Branch. Researchers, extension personnel, industry and grower cooperators require adequate, consistent and stable funding to ensure completion of requirements under the minor use system. More flexibility with regard to funding minor use projects is required and more communication with the sponsors of minor use projects is needed. AAFC needs to seriously consider funding that addresses the needs of specific projects under GLP and beyond fiscal year constraints.

Additionally, Canadian growers including Ontario cole crop growers, face serious repercussions from the US FQPA and loss of many of the currently registered pest control products. Because movement towards a 'level playing field' in North America is far too slow, Canadian growers will face a major competitive disadvantage. When a new active ingredient is accepted by the US EPA and considered to be a new, 'reduced risk' alternative to older pest control products, the product should be available to Ontario growers at the same time. Unreasonable and costly additional studies seriously erode the ability of Ontario growers to compete in the world market and discourages companies from introducing new technologies to Ontario. US growers may lose many of their traditional pest control products, however many new alternatives are being evaluated and registered to replace them. The members of the Ontario Crucifer Crops Committee request that this issue be seriously addressed and that concrete results be forthcoming concurrently with the USA.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.
See response to Recommendation #3.

Recommendation 9

In light of the lack of timely response to several of our recommendations, the Ontario Crucifer Crops Research and Services committee members ask that the agencies which receive our recommendations respond to them by March of the following year at the latest. If responses are sent to our parent committees (OHCRSC or OPMRSC) the subcommittee members would like to see these well before the end of the following year.

Response

The protocol has been for the chair of the OHCRSC to send letters to the appropriate people, copied to the respective chair(s) of the subcommittee, requesting a response by the "first week in March", see on page 105, Sample Letter for Response to Recommendations. Note on page 106, "Date of Response" those individuals who responded. The Chair of OHCRSC and the OMAFRA research analyst have agreed to work together to increase the level of responses.

Recommendation 10

In light of the success of the Food System 2002 program to date, this committee wishes to convey to OMAFRA, ERLD the need to continue support towards research which accomplishes the goals and philosophy of the FS2002 program. The goal of improved integrated vegetable crop management strategies leading to high quality food supplies requires a long-term and dedicated commitment.

BACKGROUND: During the course of the Food Systems 2002 program, many successful and economically sustainable research and development projects have led to significant improvements to IPM programs and pesticide reduction. According to recent figures, there has been a 30% reduction in the amount of pesticide used in Ontario and a concurrent 30% reduction in the risk associated with their use. It was also identified that further public resources be targeted to fruit and vegetable crops.

The development of IPM and more recently ICM (Integrated Crop Management) programs requires a stable and dedicated source of funding to ensure that new problems and serious on-going problems are addressed. In light of the general 'public good' that such programs have achieved to date, it is recommended that they be fully supported in the future.

Response

Allocation of funds under the umbrella of Food Systems 2002 has been completed. At present issues that where directed to Foods Systems are being funded through the Special Research Fund Program along with other competitive research funding programs.

GINSENG

Recommendation 11

The Ginseng Research and Services Sub-Committee recommends to the AAFC, Eastern Region, ARIO and specifically to PMRA that U.S. data packages and microbial fungicides be recognized and accepted by the Pest Management Agency of Canada.

BACKGROUND: North American and European markets for processed ginseng products are opening up. At a time when use and acceptance is increasing, the acreage planted in Wisconsin, the major producing area in the U.S. is being reduced annually and is expected to reach 5000,000

lbs. within three years. The objective of the Ontario industry is to begin a replacement program to export Ontario ginseng to markets in the U.S. and Europe.

High yields of quality root in ginseng production are achieved through the use of fungicides that control root rot diseases. The most destructive root rot disease is caused by the soil fungus *Rhizoctonia solani*. Rhizoctonia attacks ginseng in the first two years of garden establishment. It is not fully controlled by the process of fumigation. The fungus enters gardens on blowing sand/soil and on machinery and other items in or on which soil can lodge.

The current chemical used to control Rhizoctonia is Quintozene (PCNB). This product has a long soil residual life and accumulates at low levels in ginseng roots. The product is not used on ginseng in the U.S. and consequently that country has a zero-tolerance policy for residues in imported root. Europe discourages the use of PCNB. While the World Health Organization has placed tolerance limits for this chemical that are well above any residues found in ginseng, these residues have non-the-less become a trade barrier. Availability of new chemistry for control of this disease is being hampered by the lack of PMRA acceptance of data packages that are accepted by the EPA in the U.S. If ginseng growers were to stop the use of this product without an appropriate replacement for PCNB, losses would range from 30% - 80%. This would amount to economic losses of $20,000 USD - $48,000 USD /acre.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.
See response to Recommendation #3.

Recommendation 12

The Ginseng Research and Services Sub-Committee recommends to the AAFC, Eastern Region, ARIO and specifically to PMRA and CFIA that produce and products containing pesticides not registered in Canada be prohibited from entry into this country.

BACKGROUND: Ginseng growers in the U.S. and growers in China and Korea produce their crops with the use of chemicals not registered for use on ginseng in Ontario. Traditionally we have accepted a default tolerance of 0.1 ppm residue. This gives preferential treatment to producers who directly compete with Ontario growers (and growers in the rest of Canada). These products are not available for use on Canadian ginseng. At the same time, Canadian product entering the U.S. is allowed no detectable level of residue for chemicals that we use but they do not use.

Ontario growers are unable to take advantage of opening markets in the U.S. and Europe because of this deferential treatment.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.
A letter will be sent to Doreen Moore, Plant Products Network Director of CFIA for her response to this recommendation.

Recommendation 13

The Ginseng Research and Services Sub-Committee recommends to the AAFC, Eastern Region, ARIO and specifically to PMRA and CFIA that funding be increased and made accessible for minor use registrations.

BACKGROUND: The registration of products for use in the ginseng industry is not a priority for the chemical companies that manufacture and produce new products. Acreage is small and the reduced potential for profit does not generally warrant a large investment. As a result, this industry relies on the registration of new chemicals on a minor use basis. The EPA has moved to short data packages and parent companies are not investing in data that addresses the demands of our regulatory agencies nor are they willing any longer to fund residue analysis.

The most promising avenues to disease control in ginseng lie in the use of some of the "new chemistry" fungicides currently being developed. The ginseng industry is ill equipped to fund residue analysis for these products and to develop the additional data necessary to meet PMRA requirements. When new chemicals are registered on a crop with a Temporary permit then application for minor use is curtailed. This puts a burden on this industry and makes it uncompetitive with U.S. producers. The ginseng industry wishes to move forward to the use of newer, more specific and less residual fungicides. The industry is not large enough to do this without the financial assistance of the Federal government.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.

Recommendation 14

The Ginseng Research and Services Sub-Committee recommends to the AAFC, Eastern Region, ARIO and specifically to the Director, SCPFRC / Frank Marks, that Federal and Provincial support for the ginseng industry be increased and the number of research and support staff associated with this industry be continued. That support be made available to AAFC, OMAFRA and the University of Guelph for adequate resources to become GLP compliant.

BACKGROUND: In order to proceed with future minor use registration data, personnel must be GLP (Good Laboratory Practices) compliant. This would require additional personnel to manage and direct the collection of data.

Both Federal and Provincial governments are downsizing and at the same time requirements for data collection are being increased. GLP compliance requires extensive training and the development of standard operating procedures for each aspect of data collection. To be most effective an agency performing minor use trials must dedicate full time personnel to the task of GLP compliance. It is not realistic to think that funding for these positions come from growers. GLP compliance is a non-recoverable cost of doing business for minor use registration. It is being imposed on the research community by factors beyond their control and while it is inherently good, it carries a cost that cannot be borne by those who must comply.

Response
Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.

GRAPE AND WINE

Recommendation 15
The Grape and Wine Research and Services Sub-Committee recommends to OMAFRA, the AAFC, Eastern Region, and ARIO that continued support of the people already actively involved in research, field testing and delivery of the Integrated Pest Managementprograms for Grapes be maintained.

BACKGROUND: Developing pest management systems requires knowledge of existing pesticides, knowledge of new families of pesticides being introduced to the marketplace, the imagination to explore novel techniques for pest control or pest management and a detective's mind to piece it together. Within this matrix, resistance management must also be addressed in order to maximize the longevity of some families of pesticides. A total strategy needs to be developed and field tested, particularly if the registrations of new materials are completed soon. This means continued support of the people already actively involved in the research and the field testing and delivery.

At present, McFadden-Smith (UG) , Northover and Stobbs (both AAFC) are doing the pathology research while Trimble and Marshall (both AAFC) have been contributing to the entomology/acarology research. Walker and Huffman (OMAFRA) are the provincial specialists co-ordinating the delivery of these systems. Roberts (OGGMB and TFPMB) is the lobbyist trying to facilitate movement of new and/or renewed materials through minor-use to the PMRA in Ottawa. McFadden-Smith and Huffman have also been instrumental in gathering data for residue analyses and following Best Laboratory Practices protocols to meet with PMRA standards.

McFadden-Smith's contract is to terminate spring 2001 which will leave downy mildew and powdery mildew modelling unfinished, testing of strobilurin fungicides and other novel materials unfinished, integration of these new fungicides into existing programmes unfinished, testing of post harvest powdery mildew control systems unfinished. Her programme is part of the northeastern IPM research funded by the New York State Wine and Grape Foundation and is a well respected part of the that group as well.

There are two positions on the OMAFRA organization chart distributed just before Christmas. They are IPM ..... located at Ridgetown and .....modelling located at ???, but it is the field research and the application and integration of these strategies that needs to be addressed, not the crafting of policy. Which crops are these OMAFRA positions going to address - the most valuable (apples, potatoes, strawberries) or will it be by demand? Being located in Ridgetown, it is not likely to be fruit.

Response

Clarification of the Wendy McFadden-Smith's contract position will be part of the fruit pathology review as indicated in the response to Recommendation 2, which will include AAFC and University of Guelph personnel, Dr. Frank Marks and Dr. Clarence Swanton respectively.Cl arification of the two OMAFRA positions at Ridgetown including the IPM and modeling positions will be sent to Bill Ingratta, Director of OMAFRA Crop Technology Division.

Recommendation 16

The Grape and Wine Research and Services Sub-Committee recommends to OMAFRA, the AAFC, Eastern Region, and ARIO that all members of the Niagara Area Weather Network consortium maintain their membership to keep this level of activity.

BACKGROUND: The consortium brought together in December 1998 to buy into and administer the Niagara Area Weather Network has done so. It is presently housed at Brock University with Sandra Yee in charge of data management and general maintenance. A new site is to be commissioned at Niagara College within the next year. It is critical that all members of the consortium maintain their membership to keep this level of activity.

The partners in this venture are OMAFRA, AAFC, WCO, CCOVI, UG, OGGMB and OTFPMB. The 1999 season saw a grant awarded to the consortium that will allow for Yee's wages as well as the building of three more sites for the network. One of these is well under way at Niagara College at their new campus in Glendale. The location of the two other sites has not been finalized, but they will probably be west of St. Catharines.

One of the people instrumental in getting the consortium agreement finalized is not on the OMAFRA re-organization chart as it appeared in December 1999 and the services of D. Wismer may not be part of the OMAFRA partnership any longer. This may slow down the installation of the Niagara College pod, depending on how far it had already progressed before Christmas.

The network itself has had very little downtime in 1999 and the central hardware was successfully moved to Brock University in November with minimal interruption. Yee has created a web site that has generated more interest in the system and may be useful for more aggressive advertising for

subscribers. The fabric of the network can be better maintained in this context and it seems to be running smoothly.

Response
The OHCRSC recognizes the efforts being made by the Niagara Area Weather Network. There may be value in discussing the concern of the Grape and Wine Research and Services Sub-committee with representatives of the recently proposed agricultural microclimate network being developed, initially for southwestern Ontario, through the University of Guelph Ridgetown College.

Recommendation 17
The Grape and Wine Research and Services Sub-Committee recommends to the AAFC, Eastern Region that access to information from publicly funded trials be available.

BACKGROUND: Details: It is increasingly frustrating to both advisory personnel and other research personnel to be denied full access to information derived from publicly funded projects where the funding agency allows for proprietary privilege. Although most research personnel involved with these grants retain publication privilege, not all exercise the right and so results get buried within the company archives.

Although the CanAdapt grants are designed for technology and information transfer, the IRAP grants or Industrial Research Assistance Programme are not. Many small grants offered by this arm of the National Research Council have been used locally to sponsor industrial research that could be useful to the community as a whole. More co-operation would speed up technology adoption and prevent some duplication of effort.

Response
The OHCRSC wishes to recommend to IRAP that non-proprietary information be made available to the agricultural industry as soon as a project is completed. A letter will be sent to Bill MacArthur, IRAP for their response to the sub-committees recommendation and to determine if there are ways to disseminate the information to the satisfaction of the sub-committee. It is the understanding of the OHCRSC that the generic agreements used for AAFC and OMAFRA funding requires the dissemination or technology transfer of the information as part of the contract.

GREENHOUSE AND PROTECTED CROPS

Indicates they are able to address their research and service priorities with existing resources.

Response
The subcommittee is commended on their ability to resolve their issues within their existing resources.

GREENHOUSE FLORICULTURE

Recommendation 18

The Ontario Greenhouse Floriculture Research and Services Sub-Committee recommends to AAFC, University of Guelph, Department of Plant Agriculture, OMAFRA and ARIO that the reinvestment of financial resources into personnel is essential if innovative research addressing production and pest management issues and effective "one-on-one" grower technology transfer is to continue. The industry has identified the following key positions:

1. The need is strong for a renewed commitment by AAFC to fund an ongoing Floriculture pest management program consisting of at least two permanent positions, an entomologist and pathologist to address pest concerns on an ongoing basis and to supervise specific determinate industry funded projects.
2. A strong need exists for the University of Guelph to fill the faculty position in production-oriented floriculture vacant since the retirement of Dr. M. J. Tsujita because of the wide range of crops, production systems in Ontario floriculture and to integrate the physiology-based basic research presently underway with the production perspective;

3. OMAFRA must continue the same level of support to greenhouse floriculture technology transfer by filling the now vacant Greenhouse Floriculture specialist position previously located at the University of Guelph with the retirement of John Hughes in December of 1998.

BACKGROUND: During the past year the industry has been attempting to develop a comprehensive vision on the level and direction of research and technology transfer they as an industry would like to see the University of Guelph and both levels of government provide. They also realize that for this to happen funding is an issue. To achieve these goals, the industry appreciates the meaningful discussions to date on potential options that industry, OMAFRA, the University and AAFC might consider.

The floriculture industry continues to be dismayed at the slow erosion of support/commitment by both the federal and provincial governments and the University of Guelph to long term, ongoing research and technology transfer.

The industry has continued over the past 10-15 years to expand at the rate of 8-10% annually even when much of the economy was in severe recession. The value of the production sector of the industry in 1998 was reported as $468 million by Statistics Canada. The industry is now one of the largest in horticulture, yet is one where financial support through research continues to be disproportionately small compared with farm gate values of other horticultural crops. The industry has experienced phenomenal growth in export trade during the 1990's to the United States in both potted plants and cut flowers ($199 million in '97). For the past number of years a significant positive trade balance has existed.

The Ontario greenhouse floriculture sector is a recognized leader in crop production techniques and growing structure design in North America. Researchers and growers alike visit Ontario to study how the industry produces quality floral products so competitively priced. Floriculture, however, is a unique horticultural crop in the following ways.

Firstly, the products are generally not considered edible; they only make the world a more beautiful

place to live and work. Secondly, it is the only sector other than woody ornamentals where both levels of government gain revenue directly through sales taxes; the federal government through GST and the provincial government through PST. These revenue contributions are significant but the industry sees little investment back into one of the most vibrant agricultural sectors.

1. **Pest Management Positions at AAFC - Vineland Station**

Many developments over the past several years have culminated in this recommendation. AAFC in 1995 eliminated the Floriculture pest management program in Vineland Station leaving one senior scientist. In1997 as a result of an initiative by both Flowers Canada and Flowers Canada Ontario, matching MII funds were secured for three years to fund five specific projects at Vineland. This has been a positive development but the industry does not view this as a satisfactory way of achieving the continuity of research needed to address many of the insect and disease issues. The industry believes very strongly that both an entomologist and pathologist are needed to develop the necessary knowledge and understanding of these unique growing environments by establishing meaningful ongoing research programs. The issues surrounding both the Chrysanthemum White Rust incident and the Bacterial Wilt of Geranium that developed this past year meant that the industry could not look toward AAFC for science based information and guidance to assist in the resolution of these diseases.

The industry notes that over $2 million was spent during 1998 by AAFC on improving the greenhouse research facility at the Greenhouse and Processing Vegetable Research Centre, Harrow. In addition, a large team of researchers focused on various greenhouse vegetable production, pest management and post-harvest issues has been in place for a number of years. The vegetable industry has benefitted from this large research commitment. As a result, the floriculture industry feels that the request for a permanent pest management program, located in Vineland amidst the largest concentration of commercial floriculture producers, is justified given the sales tax dollars generated by the sector and the support given to the greenhouse vegetable industry.

Now is the time to act! The research funded by MII and industry at Vineland is entering the third year. During this time an unprecedented level of co-ordination, co-operation and dissemination of information has been initiated at Vineland as the MII-funded scientists work closely with HRIO, University of Guelph scientists and OMAFRA Greenhouse Floriculture Extension Specialists. Because developing solutions to immediate pest issues has been the primary focus, Ontario growers are already reaping the rewards of this research. As well, the research is being widely accepted as creative from both a national and international perspective.

2. **OMAFRA Greenhouse Floriculture Specialist**

The industry views OMAFRA continuing to withdraw from providing "one-on-one" technology transfer as a result of financial restraints, and their willingness to increasingly rely on the development of print/internet information packages, seminars and other technologies to disseminate information as unfortunate. The industry is concerned that the Ministry views the industry as one crop but in fact is made of four broad groups of growers (greenhouse cuts, flowering potted plants, bedding plants, and outdoor cut and dried flowers) with issues as diverse and different as those facing corn and soybean growers. The industry recognizes that as a society we are in the information age where people access information from many sources. However, the industry feels that they are already being bombarded by volumes of information from many excellent sources and is difficult to weed through the chaff. Filling the Greenhouse Floriculture Extension Specialist position, possibly located in Vineland to create a team approach, is necessary to assist the industry

manage change, and work with existing staff to evaluate and distill information that is available world wide into clear, concise " how you do it" packages.

"One-on-one" client service has been very effective over the past 25 years in assisting the industry to develop to where it is today. The Greenhouse Floriculture Specialists continue to play a vital role in providing unbiased, accurate information. Private consultants are not necessarily an option because most that work in the industry are located in the US or Europe. Floriculture consists of a multitude of crops, all with their own requirements. Each greenhouse operation is unique. The industry considers the second Floriculture Specialist position critical to the ability of OMAFRA to provide "one-on-one" technology transfer critical by being able to provide expert analytical and consultative support to individual operations and in addition evaluate and provide leading edge crop information on these diverse crops. For example the whole area of out door cut and dried flowers continues to receive very little attention. The industry realizes that under the current business climate, this request may appear unrealistic but the industry is willing to discuss various funding options including "fee for service" with Ministry senior management to insure that this important resource is maintained.

3. **University of Guelph Greenhouse Floriculture Faculty Position**

The industry views the floriculture faculty position at the University of Guelph as important also because of the opportunity to develop a meaningful production-oriented research program integrating ideas and concepts developed through basic research in areas of plant physiology and biotechnology and evaluating their application in commercial production. Secondly, with the wide scope of both flowering potted plants, bedding plants and cut flowers now being grown, there are many production research needs and opportunities.

Because the industry is expanding rapidly and adopting new technology the need for well educated but practical personnel responsible for crop production becomes increasingly more important. It is a general industry view that the University of Guelph has lost the ability to provide the industry with the qualified people it needs. Filling the vacant position in Plant Agriculture with a production-oriented floriculturist would help greatly. The industry considers the discussions with Plant Agriculture this past year as promising and look forward to helping create a solution.

Summary

While members of the OHCRSC may view this recommendation as the same as last year, the grower members attending the subcommittee meeting felt very strongly that the research priorities and recommendation should remain the same. It was their view that nothing has changed; that these positions are important to the long-term viability of the industry and the thrust of research priorities evolve slowly as answers or solutions are found. It was the consensus of the industry that over the past several years they have become very involved in funding of major research projects with limited resources to fully monitor and evaluate the research they are funding to insure the research is meaningful and to avoid overlap of research initiatives. The industry fervently hopes that research programs are co-ordinated between the University of Guelph, AAFC, OMAFRA along with industry input. The industry seeks assurance that meaningful consultation with industry will occur to explore all available options to fund the positions outlined above and avoid any duplication of research. As a major partner in funding eight projects at the University of Guelph and AAFC, consultation with industry is crucial if ongoing support is to continue.

Response

AAFC has indicated they intend to continue the level of support in pathology at this time. There are

presently 3 entomology positions located at Vineland. Setting priorities of their research activities is a continuing endeavour. AAFC and the Floriculture industry need to continue developing solutions. The recent financial resources obtained by the Floriculture industry have in fact been funded through AAFC government grants. The Floriculture industry must determine if the needs expressed in their recommendations are sufficient to warrant funding directly from their industry. Before the OHCRSC can forward this recommendation to both Bill Ingratta, OMAFRA and Dr. Clarence Swanton, University of Guelph for their responses to the OMAFRA Greenhouse Floriculture Specialist and the University of Guelph Greenhouse Floriculture faculty position the anticipated industry funding formulae needs to be discussed.

LOW ACREAGE & SPECIAL CROPS

Recommendation 19

The Low Acreage & Special Crops Research and Services Sub-Committee recommends to the appropriate agency:

1) That in order to ensure minor use registrations, government agencies need to become GLP (good lab practices) compliant. Perhaps the OFVGA should lobby on behalf of the fruit and vegetable industry to see this through. There is also a concern as to whether-or-not GLP is more of a 'service' as opposed to a 'science'.

2) Product Look Up codes seem to be industry driven, and not a requirement by a specific regulatory body. Inasmuch as PLU's may be a good idea, the cost associated with this will directly impact on the grower, and not on the wholesalers or retailers. And therefore, before PLU's become an industry standard that may or may not change, there should be some input and guidance from umbrella groups such as the OFVGA and the Canadian Hort Council.

3) That upcoming minor use proposals and uses be better 'advertised' to the grower community; perhaps by way of the OFVGA Grower.

4) Even though growers are often 'sold' on the merits of foliar feeding of their crops, there is very little hard evidence (research) to back up these practices. There is a need to become better acquainted with foliar feed products in order that better advice can be given to the farmer.

Response

Pt. 1; Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.
Pt. 2; The Low Acreage & Special Crops should forward their non-research concerns to the appropriate agencies, e.g Food Industry Branch.
Pt. 3; Craig Hunter in his new capacity with the OFVGA will address this recommendation.
Pt. 4; Referred to Dr. Dave Hume, University of Guelph, Plants Program Coordinator, Dr. Mike Goss, University of Guelph Agri-Food System Resources & Environment, to the chair of OSWARSC , Dr. Bruce Bowman and Chris Kessel, OMAFRA Program Lead.

MUCK CROPS

Recommendation 20

The Muck Crops Research and Services Sub-Committee recommends to the University of Guelph and AFFC move to certify personnel and field station sites as GLP compliant in time for the 2000-

growing season. If minor use residue trials are to be conducted in Canada, GLP certification is required. Without access to GLP compliant research field sites and personnel, minor use work will be seriously impeded. The delays in the minor use system already place Ontario growers at a disadvantage in the worldwide marketplace. Lack of access to GLP compliant sites will further slow the minor use process.

BACKGROUND: Starting in the year 2000 growing season, all residue trials will have to be conducted as GLP compliant . A large number of minor use projects are proceeding or being planned for vegetable crops in the coming years. If the field stations we rely upon to conduct these trials are not GLP compliant, the trials cannot proceed and many minor uses may not be completed. Most minor uses are already delayed by funding problems and other PMRA requirements. In light of the US FQPA and several serious pest management problems in muck crops and other vegetables, the minor use system is the only mechanism available to address grower's concerns and the sustainability of the industry.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.

Recommendation 21

The Muck Crops Research and Services Sub-Committee recommends to PMRA of Health Canada and Agriculture & Agri-Food Canada, Policy Branch that in light of the effects of the U.S.A. FQPA and the current lack of true "harmonization" the Canadian and US registration systems need to establish, "North American Standards for Crop Protection". In addition, funding is needed to cover the cost of changing to GLP standards.

BACKGROUND: Researcher , extension personnel, industry and grower cooperators require adequate , consistent and stable funding to ensure completion of requirements under the minor use system . More flexibility with regard to funding minor use projects is required and more communication with the sponsors of minor use projects is needed. AAFC needs to seriously consider funding that addresses the needs of specific projects under GLP and fiscal year constraints.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.

NURSERY/LANDSCAPE & TURFGRASS

Recommendation 22

The Nursery/Landscape & Turfgrass Research and Services Sub-Committee recommends to the University of Guelph, OMAFRA and ARIO the continued support for research into water use and water management in turf and nursery/landscape production, as well as education and extension of the information to producers.

BACKGROUND: The objective of this recommendation is identify water use and water

management research as a high priority in turfgrass and nursery production systems. The aim is to maintain and conserve water quantity and quality in the face of increasing constraints on both in the industry. Research should address problems with water supply (the input side) and the net effects of water use on production and the environment (the output side). Timely extension of water use and management information to the end users is critical.

The combination of increased demand for high quality turf and landscape production, increased awareness of potential sensitivity of water systems to shortage or pollution, and long-term changes in climate and weather (including extended drought periods in the last two years) have led to the identification of water use and management research as a high priority.
Areas which could be addressed by this research priority include - on the input side: irrigation scheduling and delivery systems; fertigation and other injection systems; the effects of water quality on turf or nursery production; use of grey water or recycled water for irrigation; nutrient recycling; and development of low water use systems through cultivar selection or management methods. On the output side research could address runoff and leaching of nutrients or pesticides; groundwater protection; and the net effects of turf or landscape systems on the water balance in managed landscapes.

Because water problems appear to be moving from chronic to acute in many nursery and turf operations, timely and efficient transfer of information arising from this research is vital.

Response
Referred to the Chair of OSWARSC, Dr. Bruce Bowman and to Randy Jackiw, Director, Resource Management and South Region.

Recommendation 23
The Nursery/Landscape & Turfgrass Research and Services Sub-Committee recommends to the University of Guelph, OMAFRA and ARIO the continued support for research into the biology and management of new and emerging pest species, both insects and diseases. Minor use label extensions and registrations may be an important part of this effort.

BACKGROUND: The objective of this recommendation is to identify as a priority research into the biology and management of pests (insects and diseases in particular) which are new, increasing in numbers, for which control chemicals have been de-registered, or for which no satisfactory control methods are currently available.

There are a number of examples of pests which prompt this recommendation. Pine shoot beetle is an increasing concern in nursery crops, with infection sources in crown land and unmanaged private stands, for which control with lindane is no longer available. Necrotic

ring spot in turfgrass is an ongoing disease problem with no satisfactory control measures. Anthracnose basal rot in turfgrass is an emerging, potentially damaging problem on putting greens which is not well understood. European cranefly and northern masked chafer represent insect pests recently discovered in Ontario which need to be researched more carefully.

Response
The OHCRSC recognizes the above commentary as a research priority and not a specific recommendation. No action taken.

Recommendation 24
The Nursery/Landscape & Turfgrass Research and Services Sub-Committee recommends to the University of Guelph, OMAFRA and ARIO the continued support for research into nutrient management and use of organic waste and other non-traditional amendments in turf and nursery/landscape production.

BACKGROUND: The objective of this recommendation is identify research into nutrient management and use of waste-based and non-traditional amendments as a high priority in turfgrass and nursery production systems. One aim is to improve the ability to use an increasing array of fertilizer sources and formulations to maximize efficiency and minimize environmental impacts. A second aim is to characterize and understand the use of non-traditional amendments

which are not well understood but have potential to be beneficial in sustainable production systems for nursery crops and turfgrass.

There has been rapid development of new fertilizer and soil amendment materials for turfgrass and nursery production in the last few years. Many are of the slow release or organically based / waste-based type, and performance and environmental impacts are not well characterized. Some have the potential to replace or improve chemical pest control as chemical methods are becoming more restricted. At the same time, water use and water quality constraints, as outlined in the recommendation above, are forcing the producer to modify or rethink fertilizer regimes. In this context, continued research on the performance of fertilizers and other nutrient management materials, especially in irrigated systems, is vital to the industry.

Response
The OHCRSC recognizes the above commentary as a research priority and not a specific recommendation. No action taken.

Recommendation 25
The Nursery/Landscape & Turfgrass Research and Services Sub-Committee recommends to

the University of Guelph, OMAFRA and ARIO that priority be given to using the most up-to-date approaches and technologies, including (for example) Internet systems, to deliver research information and interpretation in support of industry.

BACKGROUND: The objective of this recommendation is to identify the need to make full use of the potential for new technologies and delivery systems to interpret and transfer research information to the industry. This can include both new positions or task priorities in support of such transfer and improvements in hardware, software, and library or database development.

The solution to many problems in the nursery, landscape and turf industry is timely and accurate transfer of current and available information to the end-user. In the context of ever-increasing use of new technologies and approaches to accumulating, indexing, interpreting and transferring such information, this committee feels that a high priority should be placed on these improved research interpretation and technology transfer systems. There is likely to be a significant gain from investment in improvements to the interface between a large body of pertinent research information and the end-user who often does not have the time or competence to access it directly.

Response

The OHCRSC recognizes the above commentary as a research priority and not a specific recommendation. No action taken.

Recommendation 26

The Nursery/Landscape & Turfgrass Research and Services Sub-Committee recommends to the University of Guelph, OMAFRA and ARIO that priority be given to delivering continuing

education and professional development programs in woody plant pathology to nursery, landscape and arboriculture professionals.

BACKGROUND: A need has been identified for increased training in woody plant pathology in arboriculture, especially in light of the increasing stresses being placed on urban trees. The most appropriate approach may be to increase opportunities for continuing education and professional development in pathology.

Too often trees which could be saved through appropriate and knowledgeable management are being cut because trained staff is not available to diagnose and treat the problems.

Response

The chair of the Nursery/Landscape & Turfgrass Research and Services Sub-committee is advised to contact the Continuing Education sections at each of the colleges within the University of Guelph as well as open learning at the Guelph campus.

Recommendation 27
The Nursery/Landscape & Turfgrass Research and Services Sub-Committee recommends to the University of Guelph, OMAFRA and ARIO that the turfgrass management research program at the Guelph Turfgrass Institute and the University of Guelph continue to be

maintained as a high priority by filling the vacant faculty position in turf management as soon as practicable.

BACKGROUND: It is the objective of this committee to support the identified priority given by the Department of Plant Agriculture to filling the vacant turfgrass management position. Filling this position has been an ongoing recommendation of this committee since the retirement of Dr. Eggens.

In making this recommendation, we understand that this position is in the process of being filled by the Department of Plant Agriculture. Nevertheless, in the context of continuing cuts to research and university budgets, we wish to re-emphasize the vital importance of this position to the turfgrass industry in particular, and research and education in urban landscapes in general.

The turfgrass industry feels that research into turfgrass management is critical and that support and expansion of research and education in this area is very important to the continued success of the turf industry in Ontario. Guelph Turfgrass Institute has a central provincial location that provides a representative climatic zone for the province; it also has the necessary infrastructure in place to support this type of research.

Response
The Director of the Guelph Turfgrass Institute, Rob Witherspoon, has announced the initiation of a search committee to fill this vacant position. For further clarification the chair of the sub-

committee may wish to contact Rob as to the timing and procedures now being put into place to fill this position.

POTATO

Recommendation 28
The Potato Research and Services Sub-Committee recommends to the Canadian Pesticide Institute and to the Expert Committee on Weeds Canada a request that chemical companies include on the label of newly registered herbicides the interval required between application of new herbicides and planting of potatoes.

BACKGROUND: Many new herbicides used in field crops have long residual activity

which can be harmful to potatoes for several years after application. We expect this problem to increase in Ontario. Information on re-cropping restrictions is difficult to find. Residual effects of some products are not known, and companies seem reluctant to provide this information because the amount of injury varies greatly for different soil types in different environments.

Response

Referred to Dr. Chris Hall, University of Guelph, Chair of the Expert Committee on Weeds Canada.

SWEET CORN

Recommendation 29

The Sweet Corn Research and Services Sub-Committee recommends to the Pest Management Regulatory Agency (Health Canada), the Crop Protection Institute and to the Ontario Pest Management Research and Services Committee that PMRA work to simplify and speed up the registration process for new products, in order to encourage agriculture chemical industries to submit labels covering the same crops in Canada and the U.S. for equal availability of new pesticides over a range of crops.

BACKGROUND: When agricultural chemical companies develop new pesticides, the U.S. label often includes more crops compared to the corresponding Canadian label. The result is the need to expand these labels using limited public funds via the URMULE program, which delays the availability of these products to Ontario producers. Part of the problem is the perception that the PMRA is slow and holds up the entire joint registration process.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.

Recommendation 30

The Sweet Corn Research and Services Sub-Committee recommends to the Pest Management Regulatory Agency (Health Canada), and to AAFC that increase funding be made available to the

minor use registration process in order to allow research institutes to upgrade and maintain GLP standards.

BACKGROUND: With the new PMRA requirement of using GLP procedures for minor use registration/label expansions, there is concern about the level of funding for this work. Significant costs will be incurred in order to upgrade facilities to meet GLP standards, and overall the cost of this research will be more expensive.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.

TENDER FRUIT

Recommendation 31

The Tender Fruit Research and Services Sub-Committee recommends to Department of Land, Resource and Science, University of Guelph take immediate action to evaluate site suitability (climate, soil, topography, etc.) for the expansion of tender fruit production outside of the traditional Niagara area.

BACKGROUND: The objectives of Site Suitability for Tender Fruit Expansion should detail micro climates in Ontario that are suitable for tender fruit production. These sites should identify any past history of tender fruit production and any present tender fruit production in close proximity. This study should also include and update any previous studies on tender fruit expansion. The importance of a site suitability study will give tender fruit and other growers the opportunity to expand their operations outside of the unique Niagara Tender Fruit lands. This study will assist in ensuring a stable base for domestic tender fruit production in Ontario.

Presently, there are land constraints in Niagara which limit tender fruit production. All crops are affected, however, peach, nectarine, sweet cherries and apricots are at greatest risk since these crops require not only the best soils but the most favourable climate as well. There is a limited land base confined by natural barriers of the Niagara Escarpment, the Niagara River and Lake Ontario. There is competition not only from other agricultural uses such as vineyards, golf courses, and greenhouse flowers and vegetables; but also from non-agricultural uses such as urbanization and commercial. The last few years have seen a dramatic rise in land prices to the point where there will be economic limitations on the expansion of the tender fruit industry . Only a select, lucrative handful of crops will continue to expand in this expensive shrinking land base.

The demand for fresh fruit has never been better with record returns to growers and this has created a shift in marketing from processing to fresh market destinations. This has also caused a severe shortage of peach and pear supply in the processing industry. The processor now imports 34% of the peaches and 67% of the pears from sources in the United States. The processor, Nabisco, has a preference for domestic product from a quality and transportation aspect. The current industry does not supply the domestic requirements for fresh and processing sour cherries, pears and peaches which were outsourced in 1998.

Response

The Chair of the OHCRSC contacted Dr. Chris Duke, research associate with Dr. Richard Protz, Land Resource Science, University of Guelph, who indicated a willingness to discuss developing a research project with the cooperation of the industry. The Chair of the OHCRSC forwarded this information to the Chair of the Tender Fruit Subcommittee, Ken

Slingerland and Karl Evans, Field Superintendent, Nabisco Ltd. to follow-up. It became known that a study conducted by Dr. John Wiebe in cooperation with Hector Delanghe, Jim Rainforth and others to identify suitable sites for tender fruit production in Ontario was conducted several years ago. Ralph Shaw investigated the whereabouts of the report but has not been able to find the report to this date.
Discussions with Chris Duke by representatives of the Tender Fruit sub-committee is suggested.

Recommendation 32

The Tender Fruit Research and Services Sub-Committee recommends to the Canadian Food Inspection Agency, AAFC, the University of Guelph Department of Plant Agriculture, OMAFRA, and the Ontario Fruit Testing Association, Nurserymen and Tender Fruit Growers that the serious threat of Plum Pox Virus disease in North America to the Tender Fruit Industry be recognized and acted upon by the above mentioned agencies in the following ways:

Canadian Food Inspection Agency

1. In cooperation with provincial and industry colleagues, lead survey activities to provide assurance that PPV has not entered Canada, and continue to lead periodic surveys to verify the absence of PPV.
2. Supervise the entry of *Prunus* plant materials into Canada to delay the entry of PPV as long as possible.
3. Conduct virology research that assures accurate survey procedures and increase our understanding of PPV.

Agriculture and Agri-Food Canada

1. Devote research resources to assure that losses from PPV can be minimized.
2. Develop through biotechnology germplasm with a high degrees of resistance to PPV.

University of Guelph, Department of Plant Agriculture

1. Summarize world research literature relating to genetic variability and sources of resistance to PPV and methods for control.
2. Embark on an aggressive research program that will identify and develop suitable sources of plant materials with resistance to PPV.
3. Develop through biotechnology germplasm with a high degree of resistance to PPV. Coordinate the efforts of all agencies to assure orderliness of the PPV management program.

University of Guelph, Department of Botany

1. Conduct virology research that assures accurate survey procedures and increase our understanding of PPV.

Ontario Ministry of Agriculture, Food and Rural Affairs

1. Provide educational programs and resource materials that inform the industry of the seriousness of PPV, explain how to identify PPV in orchards and packing lines, and encourage procedures to minimize losses from PPV.

Ontario Fruit Testing Association

1. Produce an adequate supply of PPV tested mother plants and seed trees of suitable cultivars for the production of scionwood, cuttings and seeds for use by growers and nurserymen for the production of nursery trees.

Nurserymen

1. Use only PPV tested scionwood, cuttings and seeds for the production of nursery trees.
2. Produce nursery trees using phytosanitary standards assuring that nursery trees are free of PPV.

Tender fruit growers

1. Judiciously survey orchards and packing lines for symptoms of PPV on foliage and fruit and report findings to appropriate authorities.
2. Provide full cooperation to CFIA inspectors conducting surveys in orchards.
3. Use diligence to plant only nursery trees that are certified to be free of PPV when establishing orchards.

BACKGROUND: Plum pox virus (PPV) also know as sharka virus has been described as the most serious virus disease of tree fruits and the most difficult to control. It has been in Europe since 1910 and is known to cause necrotic symptoms on the foliage, ring spots on the fruit, premature fruit drop, reduced fruit production and poor fruit quality. It was unknown in North America until October 1999 when the disease was identified in southern Pennsylvania. The disease is spread over short distances by aphids and over long distances by transporting propagules infected to non-infected regions. There are no methods to eliminate the virus from infected trees. Control is accomplished through 1) survey and rouging of infected trees, 2) planting of resistant cultivars and 3) planting trees that are free of PPV; and *4)* other measures that contribute to these activities (consideration for buffer zones, etc.).

In October 1999, the Pennsylvania Department of Agriculture and the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture issued a joint news release stating that PPV had been detected in an orchard in Adams County Pennsylvania. The virus detected was the "D" strain of PPV, a less virulent strain of PPV than the "M" strain. Additional surveys confirmed that PPV had been identified in 18 blocks of peaches, nectarines and plums in four orchards in two townships in the northeastern part of Adams county. Due to the onset of dormancy, surveying has been suspended until leaves are available for testing next spring. Although the disease was identified in October 1999, PPV symptoms had been observed for 3 years and could have been present in Pennsylvania for 5 or more years. The disease can infect peaches, nectarines, plums, apricots and almonds

as well as several ornamental *Prunus* species, but not sweet cherries or sour cherries. PPV infects certain herbaceous hosts, but this has not been confirmed in Pennsylvania. The source of the PPV infection remains unknown.

To date, PPV has not been confirmed in Canada; however, as many as 1100 nursery trees have been imported into Ontario from Pennsylvania over the past 3 years. CFIA is preparing plans to actively survey Ontario orchard sites to determine whether PPV is currently in Ontario and Canada. On November 19, 1999, CFIA suspended all import permits for *Prunus* plant material *(except cherries)* from the United States because PPV is unknown in Canada and it causes serious damage to stone fruit crops. If PPV has in fact become established in Pennsylvania, it is unlikely that it can be kept out of Canada for more than 10 to 20 years.

If proper procedures are not in place when PPV enters Ontario, the virus has the potential of destroying Ontario's approximately $50 million tender fruit industry. The current suspension of importation of nursery trees into Canada from the US already is concern for the industry. For the spring of 2000, approximately 55,000 nursery trees (enough to plant over 200 acres of orchard) produced in Michigan are on order by Ontario growers for planting in the spring of 2000.

CFIA officials are working with U.S. officials to monitor the situation. A National Task Force of scientists, provincial advisors and industry representatives has been formed to advise CFIA on matters related to PPV and to collaborate on activities to keep Canada free of PPV.

Ontario must prepare contingency plans to assure that the devastating damages of PPV are managed such that a viable stone fruit industry can be maintained.

Response

A letter to Doreen Moore, Plant Products Network Director, CFIA requesting a response to portions of the recommendations directed to their agency will be made. Information specifically on survey work and border restrictions is necessary. The OHCRSC suggests that several of the recommendations that require field work in Ontario with this virus is not suitable and risky to the industry until results of a survey identified the extent of the disease in Ontario is understood. The Tender Fruit Sub-committee must however keep abreast of the situation with possible visits and further communications with their counterparts in both the USA and Europe.

Recommendation 33

The Tender Fruit Research and Services Sub-Committee recommends to OMAFRA that they conduct a bi-annual tree survey.

BACKGROUND: In accordance with the Ontario Fruit Advisory Committee's Business

Plan 5.5.2, a bi-annual tree survey would assist the industry to: identify planting trends as an industry; identify shortages and surpluses of each fruit commodity during a particular time of year; forecast the actual production to best match store promotions and help the shipper/dealers accurately match their supply of fresh fruit with their demand.

OMAFRA currently conducts a full tender fruit tree census every 5 years but the industry feels that an interim survey would greatly improve matching supply with demand.

Response

The OHCRSC suggests the chair of the Tender Fruit sub-committee contact the Grape Marketing Board to determine how they conduct production surveys. The sub-committee may also wish to contact Dave Hope, Director, Policy Analysis Branch at 1 Stone Road for his advice.

Recommendation 34

The Tender Fruit Research and Services Sub-Committee recommends to continue the tender fruit breeding and management programs at the University of Guelph, Vineland .

BACKGROUND: That the University of Guelph continue to maintain the two research emphasis on breeding and orchard management. Currently, the strength of the tender fruit industry has come from the new cultivars developed from Vineland and the local recommendations from research for best management practices for Ontario conditions. The importance to the growers and the entire industry to keep these positions not only as a research and teaching position, but also to continue to interact with both industry and extension.

Response

Referred to Dr. Clarence Swanton, Chair of the Department of Plant Agriculture, University of Guelph.

Recommendation 35

The Tender Fruit Research and Services Sub-Committee recommends to the University of Guelph, OMAFRA and AAFC they revise publication 430, Fruit Cultivars

BACKGROUND: The new cultivars developed locally at Vineland and other cultivars from around the world that have been tested need to be updated in both paper and electronic form for all tender fruit producers in Ontario. The importance to the growers and the entire industry to keep growers informed through unbiased OMAFRA publications continues to be a high priority with industry.

Response

The chair of the OMAFRA Publications Committee, Annette Anderson does not have any plans to publish this material in hard copy. Often by the time a publication becomes

available the information is out of date. Annette is however prepared to discuss with the Tender Fruit sub-committee representatives publishing this material on the internet within the OMAFRA web and or to develop this information on a CD. It may be advisable to break down the fruit commodities for easier updating of the information. The chair or a representative of the Tender Fruit sub-committee needs to contact Annette Anderson.

Recommendation 36

The Tender Fruit Research and Services Sub-Committee recommends that OMAFRA, AAFC and the OTFPMB review the Organophosphate Review by PMRA and FQPA on its impact and identification of high priority pest control products and potential alternatives.

BACKGROUND: The current reviews impact particularly upon the organophosphate insecticides, but as any older pesticide product comes up for review they must comply with the new regulatory procedures outlined in the FQPA. We need to review the FQPA document that was prepared in 1998 for PMRA and to update the document to identify key pest control products including insecticides, miticides and fungicides and evaluate the impact of potential loss of registration, alternatives and IPM fit. The review should also identify products available in the U.S. but not registered in Canada e.g. Indar (fenbuconazole). The review should involve representatives from OMAFRA, AAFC and the OTFPMB.

Need for Expanded Input into Tender Fruit Pathology.

With changes in staff anticipated over the next few years, the Ontario Tender Fruit Producers' Marketing Board encourages a full Plant Pathology review for tree fruit and grapes at AAFC, Vineland Station. Critical issues include:

1. Potential regulatory limitations and continued processor limitations on EBDC fungicides
2. Potential fungicide resistance to the new group demethylation (DMI) fungicides and the need for alternatives such as the strobilurins
3. Research required into the mode of action of newer fungicides, their fit into IPM, potential shifts in the pest complex due to narrow spectrum activity, resistance management strategies.
4. Availability of diagnostic tools to monitor fungicide resistant strains.

Response

Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.

Recommendation 37

The Tender Fruit Research and Services Sub-Committee recommends the need to maintain current contract research into fireblight. The 5-year AAFC-MII project will complete its third year of support in 2000. For the program to be concluded (another two years) the project financing will have to be re-negotiated. The OTFPMB encourages AAFC Vineland to continue the biological control studies to its completion.

BACKGROUND: Fireblight continues to be the number one problem for the pear industry.

Response
The program is underway.

Recommendation 38
The Tender Fruit Research and Services Sub-Committee recommends that research and extension personnel from AAFC and OMAFRA review the status of research and extension recommendations for control of Black knot disease.

BACKGROUND: This disease continues to take a heavy toll on plum and sour cherry orchards. Black knot is a limiting factor in planting new orchard blocks. A significant amount of research has been conducted in the past. One chemical product Bravo (chlorothalonil) although effective on plums cannot receive registration status.

Best management practices need to be developed on existing orchards including spray recommendation and cultural practices. There is also a need to evaluate new promising selections in a grower variety trial.

Response
Referred to Dr. John Northover, AAFC and Dr. Wendy McFadden-Smith, U of G pathologists at Vineland, and Gerry Walker OMAFRA fruit extension, requesting a review of the existing black knot information.

TOMATOES

Recommendation 39
The Tomato Research and Services Sub-Committee recommends the following:

1. The industry continues to have difficulties with situations where pesticides are registered in the U.S. but not registered in Canada. The harmonization of pesticide registration in the U.S. and Canada is the solution to this problem.

2. Bacterial diseases are persistent problems for both fresh market and processing tomato growers. The development of diagnostic tools and management strategies, including biological control, and improved methods to detect bacterial diseases of seed and plug plants is a high priority. Additional resources are required at AAFC, London and U. of G., Ridgetown to address this concern.

3. The processing tomato industry continues to stress the need for more resources into tomato breeding, particularly germplasm enhancement. This work should be carried out at AAFC, Harrow and U. of G., Ridgetown.

4. It is recommended that a Research Advisory body, comprised of AAFC Centre Directors and U. of G. Department Heads involved in horticultural research, or their representatives, be formed to work with the directors of OTRI and OVGMB in coordinating and prioritizing public tomato research activities in Ontario to ensure that research is conducted where most appropriate, to minimize redundancy of research, and to optimize cooperation of public institutions. This recommendation should be addressed to Directors, AAFC research centres and Plant Agriculture/Horticulture Department Heads, University of Guelph.

5. Good laboratory practises/Good field practises. Minor Use Registrations under new PMRA regulations (GLP/GFP) will require site certification and increased costs for residue trials and analyses. It is recommended that increased funding be made available to the minor use registration program and site certification be established at public institutions within Ontario.

Response

Pt. 1 Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of the OPMRSC.

Pt. 2 Existing resources at both AAFC, London and Ridgetown College are available to address this research need. If further resources are required researchers are advised to partner with industry, reduce work on lower priority items and/or apply to the many competitive funding agencies available.

Pt. 3 Consultations with the tomato industry are underway. AAFC, Harrow has responded with increased funding towards germplasm enhancement. There are outside competitive funds that the tomato industry need to access or prioritize to further increase breeding research activity.

Pt. 4 The public funded agencies including AAFC and the University of Guelph have cooperated in attending research priority setting sessions in the past and would like to be included with the directors of OTRI and the OVGMB. A letter will be sent to the OTRI and to the OVGMB indicating this interest. One of the roles the Ontario Tomato Research and Services Sub-committee plays is to set research and service priorities. A refocusing of the roles and activities is required.

APPENDIX

ALPHABETICAL LIST OF ABBREVIATIONS..... i

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ALPHABETICAL LIST OF ABBREVIATIONS

AAFCAgriculture and Agri-Food Canada
ABPVAcute Bee Paralysis Virus
AFLSAgri-Food Laboratory Services
BCBritish Columbia
CANGOCommercial Association of Nut Growers of Ontario
CHCCanadian Horticultural Council
CLPCentral Leader Pruning
CPBColorado Potato Beetle
CTGAChristmas Tree Growers' Association
CWICanadian Wine Institute
DFVIIBDairy, Fruit and Vegetable Industries Inspection Branch
DRCDelhi Research Centre
EFPEnvironmental Farm Plan
ERMEuropean Red Mite
EYCEnvironmental Youth Corp.
FP&IFood Production and Inspection Branch
GGACGinseng Growers' Association of Canada
GTIGuelph Turfgrass Institute
GUARDGuelph Alumni Research and Development
GWMGreater Wax Moth
HBTMHoney Bee Tracheal Mites
HESHorticultural Experiment Station
HRCHarrow Research Centre

HRIOHorticultural Research Institute of Ontario
IPMIntegrated Pest Management
KCUGKemptville College, University of Guelph
MFTRManaged Forest Tax Rebate
NAFTANorth American Free Trade Agreement
NOTLNiagara-on-the-Lake
NPFVGANiagara Peninsula Fruit and Vegetable Growers' Association
OAGMBOntario Asparagus Growers' Marketing Board
OASCCOntario Agricultural Services Coordinating Committee
OBAOntario Beekeepers' Association
OBLROblique Banded Leaf Roller
OBGAOntario Berry Growers' Association
OCPCOntario Crop Protection Committee
OFMOriental Fruit Moth
OFVGAOntario Fruit and Vegetable Growers' Association
OGGMBOntario Grape Growers' Marketing Board
OGVPMBOntario Greenhouse Vegetable Producers' Marketing Board
OHCRSCOntario Horticultural Crops Research and Services Committee
OMAFRAOntario Ministry of Agriculture, Food and Rural Affairs
OMEEOntario Ministry of Energy and Environment
OMNROntario Ministry of Natural Resources
OMSPAOntario Maple Syrup Producers' Association
ONTAOntario Nursery Trade Association
OPAOntario Pollination Association
OPMRSCOntario Pest Management Research and Services Committee
OSCIAOntario Soil and Crop Improvement Association
OTFPMBOntario Tender Fruit Producers' Marketing Board
OTSPGMBOntario Tomato Seedling Plant Growers' Marketing Board
OWSOAOntario Woodlot and Sawmill Operators' Association

PDCPest Diagnostic Clinic
PEDPotato Early Dying
PIBPlant Industry Branch
PLRVPotato Leaf Roll Virus
PMRCPest Management Research Centre
RCUGRidgetown College, University of Guelph
TSSMTwo-Spotted Spider Mite
TuMVTurnip Mosaic Virus
UofGUniversity of Guelph
URMURUser Requested Minor Use Registration
USUnited States
VQAVintners' Quality Alliance
VRCVineland Research Centre
WCOWine Council of Ontario

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GREENHOUSE AND PROTECTED CROPS (26 members)

Greenhouse Vegetables (16)

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Mushrooms (10)

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GREENHOUSE FLORICULTURE (22 members)

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